THE IRON TRADE REVIEW

VOLUME XXVIII. CLEVELAND, O. MARCH 28, 1895. CHICAGO, ILL. NUMBER 13.

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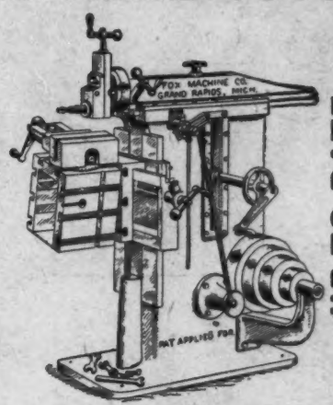

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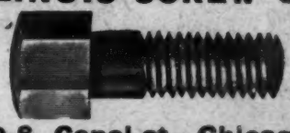

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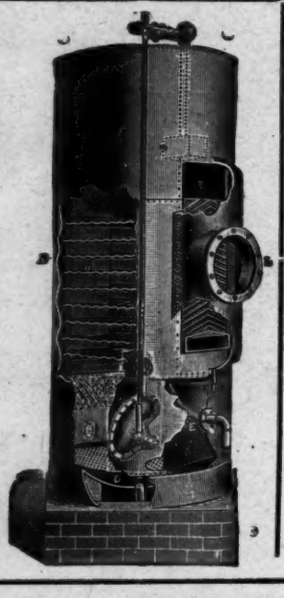

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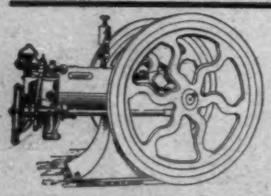

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THE IRON TRADE REVIEW

VOLUME XXVIII. CLEVELAND, O. MARCH 28, 1895. CHICAGO, ILL. NUMBER 13.

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The wage advance in the Connellsville region and the consequent advance in the price of coke, have been followed by several developments contributing to the support of the movement toward a better basis. Within the week the producers of standard Lake Superior Bessemer ores have communicated to their customers the new price basis that is to be maintained on these ores in 1895—an advance of 15 cents a ton from the opening prices of 1894, and some ore has been sold in the past few days at the higher price. Simultaneously, as the result of a movement started before the beginning of the year, Western bar iron manufacturers have got together to try to check some of the demoralizing practices that have made that end of the finished material market a weariness to all connected with it. Outside of the iron trade, moreover, the past fortnight has brought more signs of promise than have come together in any equal period in months. The demand for money has increased and expanding commercial loans have caused a hardening in the rate. The first half of March shows an improvement in railroad earnings over the corresponding period in 1894—very slight, to be sure, but a reversal of the record of preceding months. Contributing another increment of encouragement is the completion of the arrangement among bituminous coal carriers in Ohio to get a fair freight rate and stop in its incipiency a disastrous war in freights to Lake Erie. In the Pittsburg district, the action of the railroad coal operators, in agreeing to pay 60 cents for mining, or a five-cent advance, though it falls short of the men's demand for 69 cents, signifies the end of the old prices. The direct reflection by the iron trade, of these better symptoms, is confined to Bessemer pig iron and soft steel, so far as prices are concerned. Demand in certain directions has been checked by the sudden unwillingness of sellers to take contracts at old prices, especially for deliveries extending through the second quarter of the year. It is known that a few sales of Bessemer iron have been made the past week at $10.40 Pittsburg, and others at $9.85 at valley furnace. The latter figure has been refused by other sellers. The increase in fuel cost to furnacemen may not be a real factor for three or four weeks, many having stocks that will last well into April. It now seems probable that the advance will be more than was at first thought, and $1.25 and $1.35 are talked of, with quotations made at the latter figure. Both Bessemer pig and billet prices are likely to be uncertain quantities for some time; the liability to a reaction from anything more than a moderate advance is generally recognized, in view of the accumulation of stocks and the unsatisfactory condition of rail mill order books. Yet the tonnage of all classes of mills is larger than at any time in a year and is steadily increasing. There is even an encouraging report from the foundry end of the market. Pig iron buying by that interest has been much heavier in March and has been more general in the past week than in the two immediately preceding.

THE CLEVELAND OUTLOOK.

The past week has seen the beginning of activity in the iron ore market. On the 25th, various ore firms acquainted their customers with the prices that would be asked for 1895 ore, and it is well understood that whatever price is established by the large transactions now pending will be maintained through the season, so far as standard Bessemers are concerned, and that the early buyer will not take any chances, as in other years, of contracting on a higher basis than is paid by furnacemen who buy from time to time and follow the market through the season. Some business has been done the past week, with negotiations now in progress that are expected to terminate soon in sales of considerable size. The vessel market has shown more definite developments in the past few days than have appeared thus far in ore. Charters covering 375,000 tons of ore, and running to Oct. 1, have been made from Duluth at 75 cents. The Mesabi ore involved will be consumed by furnace interests controlling the mine. There is surprise in some quarters that the 75 cent rate was so readily obtained, but the point is made that 75-cent charters, that leave the vessel-owner free to take advantage of the higher rates that may come in October and November, do not necessarily mean season charters at 75 cents. Some owners are firm in holding to 80 cents as a season figure. On the other hand it is recalled that the opening charters last year, at 80 cents, ran only to Sept. 1 and Oct. 1, yet that figure was established soon after as the season rate. Some Pewabic ore has been covered in the week by Escanaba charters at 55 cents, the business going to Milwaukee boats.

Pig Iron. There is little to report in actual pig iron transactions for the week just ended. Offers continue to be made and the most to be heard is of the turning down of those on Bessemer pig, $9 75@$9.85 in the valley having been refused in turn. There have been a few sales on the latter basis. Between the buyers' view that a reaction will be seen and the quotation of the stronger sellers, $10 at furnace, there is not likely to be much done for the present. One coke producer has quoted $1.35. No contracts on this basis are reported, however. Foundry iron is in somewhat better demand, and certain producers are refusing offers of $9 for No. 2, and holding for $9.25 in the valley with more firmness.

Finished Material. Representatives of practically all the bar mills west of Pittsburg met in Cleveland Wednesday, March 27, and are in session at this writing. Valley manufacturers, none of whom attended the Indiana meeting a few months ago, were present Wednesday by invitation. No agreement has been reached and it does not yet appear that agreement is possible. The features of the trade that need reforming are well known; uniform action is another matter. Local demand for various kinds of finished material is unchanged. The quotation of $15.25 by a new seller of billets in this market and some sales at that figure do not argue for firmness. Some 600 tons of bridge material were bought in the week. At Toledo, the Toledo Bridge Co.'s bid was lowest on the local structure that involves 1,700 tons of material.

THE CHICAGO OUTLOOK.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

The only item of interest in this city is the change in the presidency of the Illinois Steel Co., noted in another column. This change had no influence upon the situation in any way, as it involves no new policy and was only made to relieve the old president of the company of part of his labor. The market has been quiet, and no sales of any size of any class of material have been made. The feeling of cheerfulness noted lately is still observable, and dealers seem to expect an increase in the volume of business, though they say it will come gradually in the next few weeks, as it has been coming in the past.

PIG IRON.—While the sales of pig metal of each week are only a little larger than the preceding week's, there is a noticeable improvement all the time, and the difference in the volume of business now and a month ago is very large. The improvement is undeniable, and is continuous. Foundries of nearly every class are doing a much larger business now than they were a month ago, and there seems to be every reason for thinking that orders will continue to be plentiful. In the past week local iron has sold well in small lots, and two or three orders of 500 tons each were placed. There is a good inquiry, and it seems likely that the next several weeks will keep up the record of betterment. Shipments on contracts are being called for as rapidly as the furnaces can make them, and most of the smaller orders placed are for immediate delivery. Prices are being maintained, and no cutting is reported. Southern iron is in good demand, and a few sales ranging from 500 down to 200 tons were made, besides quite a large carload business. The market is not strong, and several of the sales made in the past week were at a figure quite a little under the open quotations. No changes have been made in quotations, however. Prices are made as follows:

Lake Sup. Charcoal	$13 00@13 50	Southern No. 2 Soft	$ 9 75@10 00
Local Coke Fdy. No. 1	10 25@10 50	South'n Silveries No. 1	11 50@11 75
Local Coke Fdy. No. 2	9 75@10 00	South'n Silveries No. 2	11 25@11 50
Local Coke Fdy. No. 3	9 40@ 9 65	Jackson Co. Silveries	15 00@16 00
Local Scotch Fdy. No. 1	10 25@10 50	Ohio Silveries No. 1	14 00@14 50
Local Scotch Fdy. No. 2	9 75@10 00	Ohio Silveries No. 2	13 00@13 50
Local Scotch Fdy. No. 3	9 50@ 9 75	Ohio Strong Softeners	12 50@13 00
South'n Coke No. 2	10 00@10 25	Alabama Car Wheel	17 50@18 00
South'n Coke No. 3	9 50@ 9 75	Malleable Bessemer	11 00@11 50
Southern No. 1 Soft	10 00@10 25	Coke Bessemer	11 00@11 50

BARS.—Business in the week under review was rather quiet, a single sale of any size—one for several hundred tons to a car works—being reported. General business was of fair volume, a little better, possibly, than the week previous. Prices continue firm, and are made at 1c for common iron; 1.10c to 1.15c for guaranteed, and 1.20c for soft steel bars from strictly billet stock.

RAILS AND TRACK SUPPLIES.—The volume of business appears to be growing larger every week, but the improvement is very gradual. No large single orders have been placed as yet, but it is believed that the time when some of the large roads come into the market for good tonnage is not far distant. Quotations are maintained at $23 to $25 for rails; splice bars, 1.25c to 1.30c; track bolts, 1.95c to 2c; spikes, 1.65c to 1.70c.

BILLETS AND RODS.—In the week just past quite a large inquiry was received for billets, and it is likely that the local mills although well filled, will be able to take a few more orders for delivery before July 1. Prices are unchanged at $16.50. Rods are quiet, and no sales are reported. They are quoted at $23 to $23.50.

STRUCTURAL MATERIAL.—The Rock Island road has asked for bids on material for more track elevation, and will probably renew work in the near future. General business is still increasing and a very satisfactory tonnage is placed each week. Quotations are unchanged as follows: Beams and channels, 1.45c to 1.50c; angles, 1.30c to 1.35c; plates, 1.35c to 1.40c; tees, 1.65c to 1.70c. Small lots from stock are quoted at ¼c to ½c higher.

PLATES.—The better inquiry noted last week continues and while no large orders have been placed it is probable they will be in the near future. Meanwhile a good business is being done in small lots. Quotations are a little lower. Tank steel, 1.25c to 1.35c; flange steel, 1.50c to 1.75c; firebox steel, 2c to 5c; boiler tubes, 75 to 77½ per cent discount.

MERCHANT STEEL.—The call for this class of material is light in the way of new business, but specifications on old contracts are coming in rapidly. Prices are continued: Open-hearth spring, tire and machinery steel, 1.55c to 1.60c; smooth finished tire and machinery, 1.50c to 1.60c; Bessemer bars, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—A good demand and fair sales are reported for several kinds of scrap, and the market is quite a little more active. Prices are unchanged as follows: Railroad forge, $8.50 to $9; dealer's forge, $7; No. 1 mill, $6 50; No. 1 machinery, $7; axles, $12 to $12.25; cast borings, $3.50; wrought turnings, $5.25; axle turnings, $6.25; mixed steel, $5; heavy cast, $7 to $7.25; stove plates, $5 to $5.25; heavy melting steel, $7 to $7.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Pittsburg. The coke situation temporarily dominates the market for Bessemer pig. Furnacemen have had $1.35 quoted them on coke delivered in the second quarter of the year, but no one has tied up at that figure. While the leading coke producers have advanced wages and will advance prices, there are some smaller operators who have sold up to the middle of the year on the low basis, and who might prefer shutting down to paying the advance. The loss of transient trade meantime and ultimately, perhaps, the loss of customers with whom the low priced contracts were made, is the other side of the account. There are indications that coke in April, May and June will cost more than has been figured on in some quarters. Thus far circulars have not been issued. There will be no lack of coke in furnace yards for a short time, at least, as all have been ordering freely in the past two or three weeks. The Bessemer pig market has shown little business actually closed the past week. A few small transactions are reported at $10.40, but buyers are holding off expecting that the situation in finished material and the accumulation of Bessemer iron will assert themselves in a reaction from the present quotations of furnacemen. The latter, in view of higher coke, are quoting on a $10 basis in the valley for April, May and June delivery. Spot transactions, involving iron in yards, are somewhat lower. The uncertainties of the situation suggest a wait on both sides. On billets, quotations have advanced 25c the past week and whereas some of the lowest transactions on record were made just before the advance in coke wages was announced sellers are now firm at $15 and are not seeking business. In all lines of finished material, mills are fairly busy, though without any perceptible stiffening in prices. The structural demand continues good, and the call for sheets is well maintained. Plates are selling in small lots, with no large contracts pending.

Cincinnati. The improved demand for iron continues, and being entirely void of any speculative features, it would seem to indicate that there is a larger melt

throughout the country than for many months past. The volume of business for the week just closed may be correctly described as large. It compares favorably, indeed, with corresponding months of the heavy years of 1890 and 1892. The surprising thing is, that with all the buying there is scarcely a sign visible of betterment in prices. The eagerness to sell is as great as ever, and the market is at the very bottom in all forms of crude iron. This indicates a fear that the improvement in demand is but a temporary spurt, to be followed by a lull later on. One very significant feature is the hardening of money rates, showing larger demand in all parts of the country.

Philadelphia. So far this month there has been a large increase in sales and shipments of pig iron and coke. Prices in Pittsburg are on a higher plane by at least 25 cents a ton. This would seem insignificant in ordinary times, but in these degenerate days it means a veritable boom. Since wages have been advanced, coke will have to be sold at more remunerative figures. The same condition of things will apply to the ore men, and eventually business may be done on a paying basis.

Buffalo. The increased activity noted as having developed last week continues, and orders for 500 to 2,000 tons each are as frequently heard of as 100-ton and 200-ton lots a short time since. The better demand has had no influence on prices so far. Whatever talk there is of higher figures comes from furnaces dependent on the Connellsville district, which are now selling at cost, and must add whatever advance is decided upon to their price. Buying is chiefly confined to strong coke iron, with very little doing in charcoal iron or softeners.

MAHONING VALLEY'S IRON PRODUCT.

At the banquet of the Montgomery Republican Club at Youngstown, O., Thursday evening, March 21, Jos. G. Butler, Jr., general manager of the Brier Hill Iron & Coal Co., responded to the toast "The Mahoning Valley." We reproduce below the portion of his interesting address which gives the facts that help to measure the growth and the importance of the Mahoning valley as a center of iron and steel production:

The Mahoning valley proper extends from a point near Leavittsburg to the mouth of the Mahoning river near Lawrence Junction, a distance of 37 miles, and contains in this stretch a population of 75,000.

The industrial activity of the valley is represented by 12 blast furnaces, 12 rolling mills, one steel plant and about 100 other manufacturing establishments with invested capital of $20,000,000 with 15,000 employes. The present daily output of the furnaces is 2,500 tons, of the mills 2,000 tons and the steel plant 500 tons, which will shortly be doubled.

One of the important industries of the Mahoning valley is the quarrying of limestone, the annual output ranging from 600,000 to 1,000,000 tons. The quarries are at the lower end of the valley and supply all the Mahoning valley furnaces, nearly all the Shenango valley stacks, all the Ohio valley, Wheeling and Steubenville districts and a large part of the Pittsburg district.

Our mills and furnaces have kept up in the march of improvements. From an output of 25 tons per day in 1875, the furnaces have increased anywhere from 200 to 300 tons per day each furnace. The mills have also increased their productive capacity. A train of rolls which 20 years ago produced 30 tons per day, can now give a daily output of 70 tons.

PIG IRON.

Large sums of money have been expended in improvements ranging from $100,000 to $500,000 to each plant. Many concerns have been practically rebuilt. There have been enormous reductions in the cost of production. In 1865 the cost of making pig iron was more than $50 per ton. At present it can be produced for about one-fifth that sum. I have recently examined an old furnace report which shows the exact cost for a stated period $50.81. The Lake Superior ore was put in at $15.50 per ton. The same ore sells now for $2.50. The fuel then used was coal, which cost $10 per ton, and the limestone was about four times its present price.

As pig iron is the foundation of all forms of iron and steel products, large reductions in the cost have been made all around. In my own time I have known common bar iron to sell for six cents per pound. It can now be had for one cent per pound and less.

The Mahoning valley has always been noted for the exceptionally good quality of its pig and bar iron. As bar iron has largely been supplemented by bar steel, our mills are still keeping up their good reputation and are being aided by the Ohio Steel Co. Although this plant has only been in operation a couple of months, the mills have already made tests and find it of better quality than they can obtain elsewhere.

The Mahoning valley has been noted for a quarter of a century for the special good quality of its Bessemer grade of pig iron, and the product has been shipped to all the prominent steel plants in the country. It will, however, be largely used at home.

The Mahoning valley is the birthplace of American Scotch pig iron. The place was Mineral Ridge, and the father of American Scotch is Jonathan Warner, an aged and honored resident of this city. He it was who first discovered the Black Band ores, which would produce an iron equal and similar to the foreign article. American Scotch is now made at Hubbard, Lowellville, Haselton and Brier Hill, and as the Black Band ore fields have been exhausted, the iron is now made from a mixture of Lake Superior ores fully equal to the Black Band iron. This iron is shipped from the Mahoning valley to nearly every state in the Union, and has driven out the foreign article.

OTHER IRON PRODUCTS.

The Mahoning valley is also the birthplace in the United States of "washed metal," which has been made at Brier Hill for many years past with such success that the inventors of the process would scarcely recognize it. In an investigation made a number of years ago by the Senate ordnance committee, Senator Hawley, as chairman of the committee, recommended the washed metal, which was adopted by the Bethlehem Iron Company, and that company commenced and has continued its use to the present time in the manufacture of armor plate for the United States Government. A contract recently secured by the Bethlehem people from the Russian government is based on the washed metal made at Brier Hill.

The Mahoning valley is also noted for the manufacture of products other than bar and pig iron, such as tubing made in large quantities at Warren and Youngstown, cold rolled shafting, railroad splice bars, coupling pins, cotton ties and horseshoe bar. It has been estimated that the horses of the United States carry around with them 100,000 tons of iron and steel in the shape of horseshoes. One-fourth of this is produced in the Mahoning valley, and one-half of the cotton crop of the South has been baled for the past quarter of a century with cotton ties made by Mahoning valley manufacturers.

The manufacture of tinplate also has been commenced at Niles on a large scale and will, no doubt, prove a success. The Falcon Tin Plate Co. will produce 150,000 boxes of first class tin plate this year.

TONNAGE STATEMENT.

I have with me a lot of statistics. I will state that in 1880 the raw material and product of the valley was 1,952,576 tons. In 1888 it had increased to 2,465,400 tons, and in 1892, the last year of Republican rule, it had increased to 4,000,000 tons.

A year's tonnage statement of the Mahoning valley today would be about as follows:

	Tons.	Tons.
Blast Furnaces.		
Raw material	2,163 750	
Product	675,000	
		2,838,750
Rolling Mills.		
Raw material	1,202,500	
Product	475,000	
		1,677,500
Steel Plant.		
Raw material	435,000	
Product	300,000	
		735,000
Pipe Mills.		
Raw material	133,000	
Product	50,000	
		183,000
Limestone product		600,000
Miscellaneous, raw material and product		210,000
Total		6,244,250

THE IRON TRADE REVIEW

DEVOTED TO
IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES, IRON ORE PRODUCTION, TRANSPORTATION, AND GENERAL INDUSTRIAL PROGRESS.
PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND:
27 VINCENT STREET.
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CHICAGO:
1141 MONADNOCK BLOCK.
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TERMS OF SUBSCRIPTION, (strictly in advance):

One year	$3 00
Six months	1 50
Three months	75

Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW, through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE IN CLEVELAND, O., AS SECOND CLASS MATTER.

MARCH 28, 1895.

THE ADVANCE IN RAW MATERIALS.

While there is almost general satisfaction with the advance in both coke and Bessemer ore, there is a semi-demurrer in the suggestion reflected in one or two market comments that an advance in prices of raw materials should come as the result of expanding demand for finished material. Perhaps this is true enough as a general proposition and under ordinary circumstances. But it is to be said, on the other hand, that an advance in raw materials is always in order when labor and capital engaged in their production are sacrificed to maintain a low-level market. Why wait longer to advance the price of coke and the wages of coke workers, when coke is being sold at a price that means the steady impairment of the investment, for capital—the giving away of the choicest coking coal deposits in the world, with no return on the vast outlay of money in equipping them—and when coke laborers are contributing the capital of muscle and capacity for arduous work, at wages scarcely sufficient to maintain their bodies in condition for their daily toil? The need of taking hold of the situation that has long prevailed is the more emphasized, when coke production has gone on at a rate never before equalled in the Connellsville region, and yet so far from this expanding demand operating to keep up prices, there is no more effect on the market than if a law of supply and demand had never been known. There are millions of tons of Connellsville coke in the ground and there is oven capacity for a larger product of coke than has ever been achieved, even with the best records made. Who could hope, then, for an advance in prices and wages to come by waiting until the market wanted more than could be made, or until coke consumers had got all the markets in which they sold, in shape to stand an advance?

The situation as to iron ore has been gone over in these columns, since the close of navigation in December, with sufficient detail to indicate the grounds for the position taken by the leading producers. Being the base of the great column the iron industry has reared, there should be some solidity to the iron ore interest. It was felt that weakness and disintegration there would only mean greater demoralization in the industries of which it is the base. It is well known that the blast furnace capacity and the steel mill capacity of the United States are far in excess of any probable demand for months, possibly for two or three years. With the advent of April and the starting of the great plant at Lorain, the converting capacity in Ohio alone will have been increased three quarters of a million tons a year since Feb. 1. And the modernizing of plants farther east in the past year has steadily added to the possibilities there. It cannot be expected, with such additions to steel mill capacity, coincident with a slow return of normal demand, that an uplift of prices will come from that end of the market and work backward toward raw material. It remained for the primary iron industry to put a period to doing business at a loss.

It has been found that the interest nearest to ore producers, that of the furnacemen whose ores come from Lake Superior, for the most part concedes that the step over the line that divides profit and loss can best be taken by the ore companies. Pig iron producers reason that if all are affected alike by the advance, and it is adhered to, there can be no hardship, and in the end it may give some stimulus to their own industry, enabling them to get back the additional cost of raw material and perhaps a little more. Courage is contagious as well as timidity and distrust, and to have one set of producers take a stand, with their backs against the wall, ought to help brace those just in front of them, who have been steadily falling back until they have lost capacity to execute a forward movement.

Whatever other times and other circumstances might have suggested as the fit order for an advance in iron and steel prices, it seems plain that at this juncture the initiative was bound to come from those who have taken it.

INDICATIONS OF IMPROVEMENT.

With the long straining of eyes for signs of industrial and commercial improvement, and with the repeated announcements of beginnings of better conditions in this and that direction that turned out to be false starts, it might be difficult to believe that a single fortnight has brought more encouraging indications than any like period in a twelve-month. Yet this distinction belongs, in the minds of many, to the two weeks just behind us. The month of February was disappointing in many particulars. Its severe weather, with heavy snows in sections generally free from snow, resulted in poor railroad business and the hopes of better statements from the transportation lines, that had been disappointed in January were again postponed. March has brought a slight change for the better in this regard, and while a good crop year is considered indispensable to any decided increase in earnings of Western roads, there is a slow yet steady improvement in general traffic. While the pooling bill failed in the last Senate it directed attention afresh to the crying need of some movement to check demoralization in freights, and the recent efforts to that end by the traffic associations have been more resultful.

As briefly synopsized on another page, the better indications at money centers are not only increased clearings, but advancing money rates and evidences that money is going out more freely on commercial loans. Mr. P. D. Armour is quoted as saying that whereas he borrowed $3,000,000 at 2½ two months ago, for use into the summer, such a loan would be impossible to-day at less than five per cent. While there has been a disposition to attribute the increased demand for money to the wants of home subscribers to the recent bond issue, the fact that it has kept up and widened supports the view that more funds are needed for pay rolls and enlarged operations.

Higher wages for coke workers mean that the thousands

so employed in the Connellsville region will have more money to spend; higher wages for coal miners in Pittsburg and other districts mean enlarged purchasing power there also. It is in this way that betterment must come; increased pay rolls will put more money in the people's hands and increased buying means a better market for all industries. The country cannot jump itself to higher ground at a bound. The advance will be in sections and by littles—a succession of strikes, it may be, and of sharp contests in this industry and of readier yielding in that. The leverage of one advance will be used to help to the next. And thus, hitching along, with uneven step, and not a little friction, there will be a slow and at times painful movement toward better things for wage-payer and wage-earner.

THIS from the Glasgow market review of the London *Iron and Coal Trades Review* is not as specific as it might be, but it is given as a straw, indicating the direction of one trade breeze:

As showing the keenness of American competition, it is authoritatively reported that Glasgow firms are receiving deliveries of United States steel material at lower prices than it can be made locally.

The Coke Situation.

With shipments of 9,003 cars in the week ending March 16 and production estimated at 159,225 tons, the Connellsville coke output indicated in advance the expectation of furnacemen that either a strike or a higher price was to come April 1. The announcement of higher wages did not come until the 15th, so that the large shipments noted were made before consumers had definite information as to the new development. Today's production and shipments are keeping up the pace and the ovens in blast are getting out every ton they are capable of producing. The new price of coke has not been announced, but there is a general opinion that the circular quotation on furnace coke will be $1.25. There is some skirmishing for position, among Connellsville operators and reports are current of another attempt to agree on a price that can be maintained. But the same elements that conspired to prevent such an arrangement before still exist. Uniformity as to wages will exist, since none of the operators have refused to make the advance with April 1; yet there is a leeway for cutting, with an advance to $1.25, or, as some forecasts have it, to $1.35. The Connellsville *Courier* says: "The manufacturers who are reluctant to grant the advance are those who have cheap three and four months' coke contracts on their hands. It might be cheaper for them to allow their men to strike and keep their plants idle for several months than to pay the increased wages and sell their coke at 85 and 90 cents per ton."

Only Ten Years of Steel Lake Vessels.

In the concluding paragraphs of a signed article contributed to the marine edition of the Cleveland *Plain Dealer* of March 28, John M. Mulrooney, editor of the *Marine Review*, directs attention to the transformation in lake shipbuilding, in a single decade, and the effect of the immense tonnage added in that time upon the vessel outlook for the present season:

Little more than ten years ago, John Pankhurst, Henry D. Coffinberry and Robert Wallace, who were then partners in the old Globe Iron Works, but whose interests have since been divided, were pleading with men of money in Cleveland to build an iron boat. After a hard struggle, and not until an opportune period of high freights, with a big demand for iron ore, presented itself, they succeeded, and have all profited since by their efforts. To these men and others who were first to urge the adoption of steel for lake ships there must be a remarkable degree of satisfaction in looking over the results of their early efforts in the business, though profits have been greatly reduced. The vessel owner does not now, of course, go to them as he did in the beginning, and leave an order for a ship with all matters of detail in their hands. He has been educated regarding the building and operation of steel vessels, and he not only demands certain requirements as to speed, economy, etc., but also figures close on the price.

Competition—plenty of ships—has brought both builders and owners to a condition of small margins. Two years with the closest kind of figuring on operating expenses has left little more than a moderate profit for the best of ships, and yet there are 17 new freight vessels of about 51,000 gross tons capacity to leave the shipyards shortly. Ten steamers of the modern 400-foot type will carry 1,000,000 tons of freight in a single season. What will be the effect of this new tonnage, and what are the prospects for 1895? The answer as regards the older and small type of wooden vessels, not built within the past 10 years, is plain. They are already outclassed and must drift to special trades in which profits at best must be moderate. The vessel interests are, however, pinning faith to the general revival in all branches of business and will not tie up extensively to low contracts for the coming season. They know that even locally the banks are now finding use for money that has been idle during two years past. They know, also, that the present consumption of pig iron and the manufacture of steel is sufficient to warrant the belief that the production of iron ore this season will be the greatest ever known, and natural causes point to a late opening of navigation, with little business at the outset to hurry an active movement of the lake fleet. Highly profitable lake freights are not expected, but it is the general belief that conditions will improve as the season advances.

The Lorain Blast Furnaces.

Now that the steel plant of the Johnson Co., at Lorain, O., is so near completion, it is understood that the erection of blast furnaces and the building of coke ovens will be taken up next. These matters have waited on the more pressing details of the steel mill, and are now to have President Moxham's attention, with the expectation that they will be pushed along in the way that has marked all the undertakings of the company in connection with its change of base. Four furnaces of 300 tons daily capacity each, will be built, and the expectation is that the Johnson Co. will be large buyers of ore in 1896. The coke plant will employ the retort system, but whether the Otto-Hoffman, the Semet-Solvay or the Huessener, is yet to be decided.

The marvelous celerity with which the steel plant is being brought to completion is the comment of all who are familiar with the developments week by week. Workmen are in possession of every part of the work and there is no waiting of one department on another. Several car loads of equipment have been hurried from the East by express in the past week, and General Manager Suppes still expects to have metal in the converters on Monday, April 1. The Lorain *Herald* says that orders aggregating 50,000 tons are now on the books.

Valley Furnace Changes.

In the Mahoning valley No. 1 furnace of the Andrews & Hitchcock Co. is out for repairs. On No. 2 furnace of the same company, which will produce Bessemer, work is progressing steadily. The Youngstown Steel Co.'s Tod furnace at Brier Hill is out for re-lining and will resume in May. Hannah furnace of the Mahoning Valley Iron Co., it is now reported, will start April 15 on Bessemer.

THE annual report of the Buffalo Merchants' Exchange with statistics of the trade and commerce of Buffalo for 1894, as prepared by Secretary Wm. Thurstone, is before us. Secretary Thurstone has brought together a large body of interesting statistics of Buffalo's commerce in 1894, comparing it with the two years preceding. In many lines there was a notable increase last year. Of grain, flour included, the total receipts were 161,401,815 bushels in 1894, against 188,730,730 in 1893 and 181,769,690 in 1892, not such a falling off as might be looked for. The railroad facilities are a marvel—450 miles of tracks with an area of 42 square miles (including the Lackawanna and West Shore yards east of the city) and this will be increased to 660 miles when terminal improvements now planned are completed.

THE committee of the Lorain, O., council appointed to confer with S. W. Croxton, of the Penn Iron & Coal Co., has agreed to dredge Black River to a depth of 16 feet up to the site of the two blast furnaces he proposes to erect, and to have the work completed by July 1.

CHANGES IN THE FIRE BRICK INDUSTRY.

The manufacture of fire brick being so closely connected with the iron and steel industry is naturally of interest to iron manufacturers generally. Pittsburg, today, on account of its large consumption, leads in the sale of this necessary adjunct to the manufacture of iron; but the Cleveland district is a good second in ths consumption of fire brick and is rapidly advancing as a selling center. In former years every one naturally went to Pittsburg and even Cleveland manufacturers looked to that city for their supply. Now jobbers and manufacturers in this district supply a large portion of the fire brick used this side of the Mississippi river and their trade extends over Western New York and Pennsylvania. They also compete with foreign brick for Canadian trade.

Up to 1840 all the fire brick used in this country came from England, but about that time large quantities of a superior quality of fire clay was found in the Savage mountains in the western neck of Maryland, together with iron ore and coal. Some Eastern men, together with English capitalists organized the Mount Savage Fire Brick & Iron Co., and in 1841 located the works in a beautiful valley at the foot of the Savage mountains, about 10 miles from Cumberland. They built two blast furnaces, among the first in the United States to use coke successfully, and also a rolling mill, as the manufacture of brick in those days was a very small item. This mill in 1844 rolled the first rails in this country that were not strap rails. They were of the inverted U pattern and weighed 42 pounds to the yard.

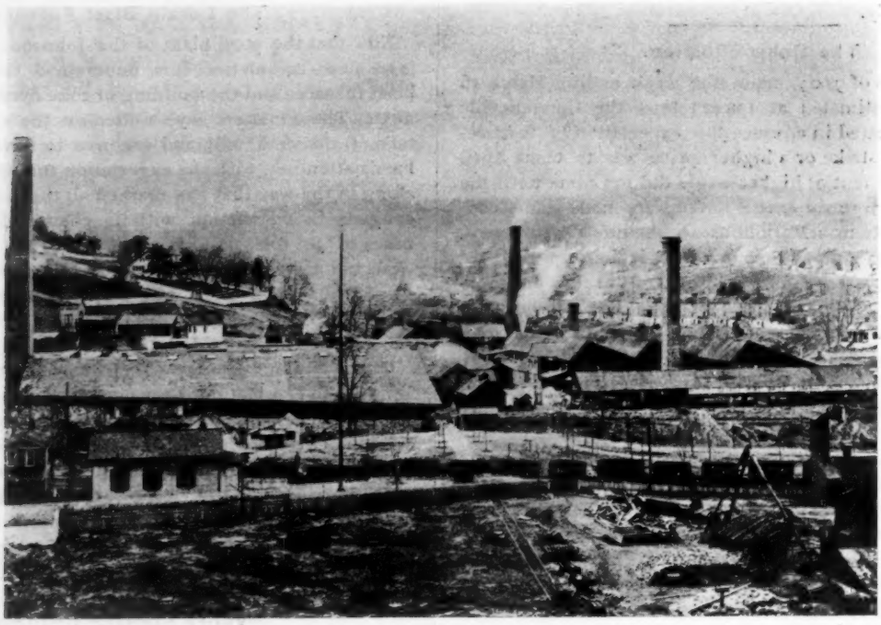
From this start and with the growth of the iron business, they have increased their works and the production of brick, until now the brick works take up the site of both the rolling mill and furnaces, and the brick business has built around it Mt. Savage, a city of 2,000 inhabitants, with the largest and most complete fire brick plant in this country and in the world.

In 1860, when the iron business had some start in this country, the Mt. Savage was the leading brick; today this condition is unchanged, something remarkable for the ups and downs of this country. Not less than ten companies have gone into the business since, who have taken parts of the name of the pioneer firm or combined it with other names, in view of its reputation, although their product was made of different clays and in different sections.

Since 1860 there have been found in Pennsylvania a number of very fine veins of flint and plastic clays, especially in Clinton, Clearfield, Cambria and Clarion counties, and there are over 20 works that have gained an enviable reputation with their brick. The fire clays of Pennsylvania, although almost the same in analysis, burn a little differently from those of Maryland—making a firmer bond and a harder brick—and where friction and heat are combined, do the best work; but in service involving extreme heat and sudden cooling, the greater porosity of brick from Maryland clay enables them to stand the contraction and expansion without dropping.

Although Maryland and Pennsylvania are today the home of fire brick, there are about 20 works in Ohio making high grade brick, that have gained quite a reputation in the last 20 years. Good flint and plastic clays are found in a small section around Canal Dover, and also through the Scioto valley, where most of the Ohio works are located. These clays differ from the best Eastern clays in containing a little larger per cent of iron and other impurities; but they are much better than some clays used in Pennsylvania from some of the lower veins, and the best fire brick made in Ohio are only second to the highest grades shipped into the State from the East, and it can safely be said that Ohio is second, both in the manufacture of fire brick and the quality of the brick.

The manufacture of fire brick can be divided into two separate branches, the manufacture of high grade brick and that of second grade brick; but iron men are only interested in the best. In the manufacturing of high grade brick every care is taken to get a mixture to withstand high heats, and before the present depression almost a premium was paid for brick doing the best work under these conditions.



PLANT OF THE UNION MINING CO., MT. SAVAGE, MD., PIONEER FIRE BRICK MANUFACTURERS OF THE UNITED STATES.

Now times are different and one would almost think that a brick is a brick, no matter what its earning capacity—for each brick has its earning capacity. In fact, it doubles its earnings, as the cost of the brick itself is not one-half the cost of labor on repairs; and if we consider the loss on furnaces, which has not been kept track of in the last two years, a very different aspect is put on some of our supposed economies. Furnacemen and mill men are beginning to appreciate this fact.

In almost every line of business improved machinery has made it possible to make sweeping reductions in the cost of producing but with high-grade fire brick the same machinery is used today that was in vogue 30 years ago. The wet pan has been replaced by the dry pan but to the detriment of the quality of the brick, and today all of the best works, although they have charged up a large amount for experiments on improved machinery, have gone back to the first process of wet-pan, hand-molded, brick. The manufacture of fire-brick is like the manufacture of bread; if you want a good article, the dough must be kneaded. A new process, the semi-dry or steam-pugged brick, within the last few years has been quite successful for second grade fire brick. Only lately has this process been used for the better grades of Ohio fire brick and with good success. It would seem, however, to be impossible to make the highest grade in this manner, as there would not be enough plasticity in the flint clay. A Northern

Ohio company has made a great success in the above line in connection with its old process.

The reduction in prices made on the best fire brick in the last few years has been made out of labor and fuel and prices are now at a point where they cannot be lowered and retain the quality of the article. And when complaints are heard, as they are today, that the fire brick do not stand as they formerly did, it may be concluded that the care and labor have not been put on them. When the price today is compared with that of former years and it is recollected that the brick go through the same process as of old and that the makers have no new and improved machinery to help them out, it can be readily seen where the fault lies. The manufacturers can hardly be blamed for making brick to meet the price they get for them.

It is to be hoped, with the now brightening business prospects that the fire brick business will receive its share of the improvement, as it has been even worse off than iron, for where is the manufacturer who does not curtail expenses in this line first? There has been quite a noticeable improvement in the inquiry for fire brick since the first of the year and some orders have been placed in this section by people who have not used any for the last two years. This speaks well for the improvement in the iron and steel business, which all manufacturers are hoping will keep up.

In the abandoning of puddling furnaces, fire brick men have lost a good friend, as there was no furnace in the manufacture of iron that could use up as many fire brick to the ton of iron and be such an unfailing source of good orders as that of the puddler. The substitution also of soft steel for iron in the greater portion of the manufactured product of today has cut down the expense and use of fire brick in a large way, as a ton of steel does not use more than 25 per cent of the number required in the manufacture of a ton of iron. This is a good thing for the steel-maker but bad for the fire brick maker. All manufacturers are taking more interest in the use of fire brick than they formerly did and it is worth their study, as the care taken in their manufacture is in a great many cases neutralized by carelessness in their use. C. F. S.

THE latest of the Gobeille Pattern Co.'s original methods of promotion and publicity is the familiar manilla envelope and telegraph blank, the printed heading of which reiterates some of the well known facts about the extent of the company's works. The message, individually addressed, and in the typical running hand of the telegraph office is to this purport: "Telegram received. Send on the prints. Can put one hundred pattern-makers on job if necessary."

THE American Pig Iron Storage Warrant Co. had in yard March 10, 124,000 tons. In the following ten days, 100 tons were put in yard and 2,000 tons withdrawn, making the net stock in yard March 20, 122,100 tons.

RAILROAD coal operators at Pittsburg offer 60c. for mining.

AN EFFECTIVE BORING TOOL.

Armstrong Bros. Tool Co., Chicago, have placed on the market the ingenious boring tool shown in the accompanying cuts.

Fig. 1 represents the tool in the tool post, the end of the bar and cap for fastening the cutter being shown in section. Two end caps are furnished, one holding the cutter at right angles with the bar, the other at an angle of 45 degrees. The rounded side slips over the cap on the end of the bar. The slot engages the cutter, screwing up the cap and pressing the cutter against the hardened pin which holds it firmly. The square side fits the steel collar screw in the split hub.

Fig. 2 shows a double-pointed cutter roughing out a cored hole; also an angle cutter at work. Fig. 3 is an illustration of the wrench furnished with the tool.

The tool is made entirely of steel, the wearing parts being hardened. The bar can be extended from its holder to any desired length to suit the depth of hole. The cutters can be ground for V or square threads, double end, round nose, or any desired shape. They can easily be made by simply grinding the end of the piece of steel to the proper shape on a dry emery wheel, and then nicking all arond on one corner of the stone and breaking off with sharp blow from a hammer.

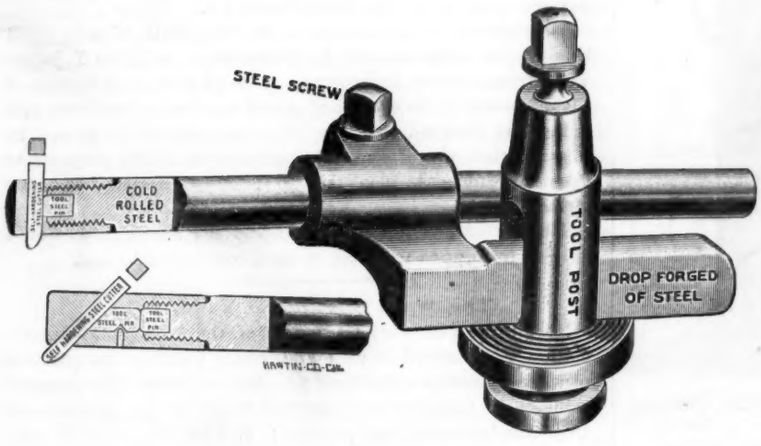


FIG. 1.

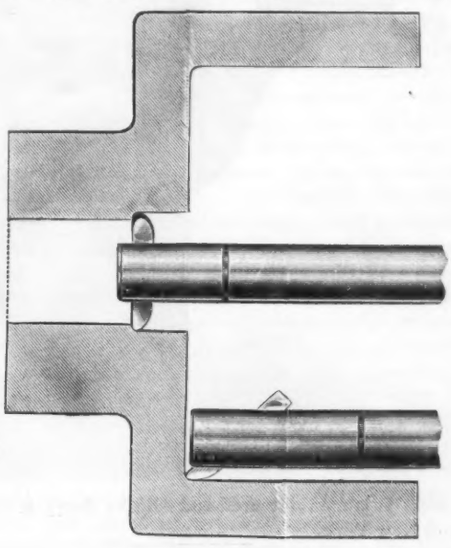


FIG. 2.

While the tool is designed for all around use, its special adaptation is to the working of self-hardening steel. The works of the makers are at 76-78 Edgewood ave., Chicago.

Andrew Carnegie's View

Interviewed in New York, Tuesday, Mr. Carnegie thus expressed himself on the prospect for iron and steel: "The outlook is that the country will consume more iron and steel this year than it did last year, and I think a good deal more if anything. I wish I could say that I thought the poor manufacturers would thereby obtain even a fair return upon their capital. But this does not seem probable to me, I am sorry to say, because the country has increased its capacity about three-fold in ten years, while the population has only increased 27 per cent. Until the country's needs require an enormously greater amount of iron and steel than at present, prices must remain low and unsatisfactory. The capacity of existing works must be largely taken up before any considerable improvement can take place in prices. I think, however, that raw materials like coke and iron will not be so cheap, and that therefore manufacturers will, in self defense, have to get something more for the finished product. But this will not be a gain to them. It will, however, be a gain to producers and that is a beginning. The manufacturers' day will come by and by."

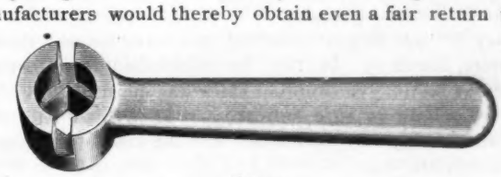
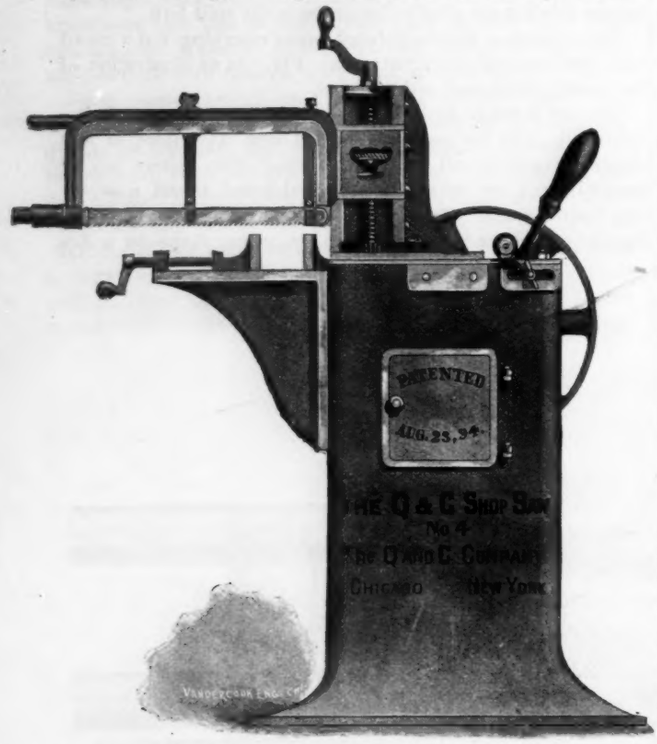


FIG. 3.

THE Q. & C. SHOP SAW No. 4.

The great interest shown in the Q. & C. shop saw lately placed on the market has led to many inquiries for a machine of larger capacity. To satisfy this demand, the No. 4 machine is now ready for the market. This machine has a capacity of straight cutting up to eight inches, and in angle cuts up to four inches. It will take the place of expensive cutting off machines, and on some classes of work will take the place of the shaper.

It gives great range of feed, is simple, and easily operated by unskilled help, making it a desirable tool for any machine



shop. It is manufactured and sold by the Q. & C. Co., Chicago and New York.

Personal.

S. Grove, M. E., of the Union Foundry & Machine Co., Pittsburg, will read a paper on gears at the April meeting of the Foundrymen's Association. Mr. Grove was formerly with the Walker Mfg. Co., of Cleveland.

Francis R. Roberts has resigned his position as cashier of the Otis Steel Co., Cleveland. It is probable that he will be identified with the Western interests of Mr. Chas. A. Otis.

J. H. Rogers, managing partner of E. Morewood & Co., Llanelly, and the Swansea Tin Plate Co., has returned to the United States. After visiting his tin plate works at Gas City, Ind., Mr. Rogers will proceed to the Pacific Coast, where very large quantities of tin plates are imported for the salmon packing and fruit canning trades.

Henry William Ellicott, a retired iron manufacturer, died at Baltimore, March 19 In 1853 he established the Maryland furnace, at Baltimore. Another stack was built in 1870. The two were rebuilt in 1872 and 1873 by H. William Ellicott & Sons, and in 1893 were dismantled and the machinery shipped to Philadelphia.

Andrew Carnegie sails from New York on Friday. His destination is Buckhurst Park, Witham, Sussex, Eng.

H. S. Mould has been made Cleveland selling agent for the Johnson Co., with office in the Cuyahoga Building.

A POCKET catalogue of the machine tools of which the Cady Mfg. Co., of Cleveland, makes a specialty, directs particular attention to their improved drop hammers, power presses, combined punch and shear and automatic wire straightener and cutter. Special wire machines and stamping and forming machinery for sheet metal and die work, sprue cutters for brass foundries, emery grinders and horizontal drilling machines are described in detail. For twenty years this firm has made a specialty of metal working machines.

LAKE SUPERIOR IRON MINES.

S. T. Beattie, who has been superintendent of the property for several years, was appointed at Milwaukee, March 26, receiver of the Florence Iron River Mining Co. An execution for $5,034.66 filed at Milwaukee in favor of Joseph Hyman, of Chicago, was returned unsatisfied. The original Iron River property was owned by Youngstown, O., capitalists, and the Florence by H. D. Fisher, of Florence, Wis., and the Van, Dykes of Milwaukee. Ferdinand Schlesinger obtained control of them and after his first failure they fell into the hands of Ladenburg, Thalman & Co., of New York. For the past two years very light shipments of the non-Bessemer ores produced at these properties have been made, though there is a considerable quantity of stockpile ore on hand.

The *Current*, of Norway, Mich., where the Penn Iron Mining Co.'s properties are located, says that the company is about to become interested in a partly developed Mesabi property, and that representatives of the company were on the new range last week on business connected with the proposed work.

The stockpile at the Aragon mine is now about 75,000 tons; 250 men are employed at present.

The Brotherton mine at Wakefield, Mich., which was idle last year is to be pumped out at once preparatory to the resumption of mining.

D. C. MacKinnon's interest in the fee of the Sheridan mine has been sold to the Sheridan Mining Co.

The decision of the lessees of the Biwabik to mine by hand this season, is announced by Superintendent John T. Jones. The stripping now in progress is hand work, and in view of the character of the over burden and number of boulders met with, it is believed that it is the more economical plan. In mining work there is not the opportunity at this property to take the wide cuts necessary to the most effective use of the steam shovel.

The *Mesabi Range*, Biwabik, notes that the Canton would employ from 75 to 100 more miners, could they be had.

The Wage Question at Valley Mills.

Within the past week the lodges of the Amalgamated Association represented in valley mills have voted on the question of wage reduction submitted by their officers. The propositions of the manufacturers are thus stated in the circular sent from Amalgamated headquarters: 1. That the price of boiling be made $3.50 per ton, and a similar reduction throughout the department. 2. A 15 per cent reduction on all finishing mills, except sheet, tin and sheet bar mills, from present prices. 3. That three-fourths round and all sizes of equal weight shall be straight bar mill price on whatever mill made. 4. In case of improved mills when there is a material increase in the production, the right is reserved to make special arrangements as may be agreed upon between the men and the manufacturer.

It is stated that the vote of the lodges was adverse to the acceptance of the reductions asked. The matter will now come up in conference between the manufacturers and the Amalgamated Association officers. The latter, it is believed, have been given discretion as to an adjustment of the differences.

An event of some significance in connection with the demand for lower wages is the withdrawal of the two Finishers' Union lodges in the Union Iron & Steel Co.'s mills from that organization and their return to the Amalgamated Association. This has been referred to incorrectly in some quarters as an amalgamation of the two organizations. It is stipulated in the arrangement thus perfected that the finishers are to have the determination of their own scale.

Owing to the discharge of four puddlers at the Andrews Bros. Co.'s plant at Haselton, all the puddlers in the company's employ went out on a strike March 23. The four men, it was alleged, had not taken proper care of their furnaces; the men, however, claim that the fault was with the bricklayers. The strike was not settled up to Wednesday. The proposition of the company that the men return to work, and that the furnaces of the discharged men be idle pending a settlement was rejected. The finishers refused to use steel billets, meantime, and their departments closed down.

A RECENT Beaver Falls record is 400,000 pounds of rods in 10 hours.

ELECTRICAL DRIVING OF MACHINERY.

There is a growing tendency to regard the use of long lines of shafting for transmitting power to the various machines as hardly abreast of the times, and yet the solution of the problem is by no means an easy task. Theoretically there is no difficulty in solving the problem by putting an independent motor on each tool, but this is at present impracticable from a commercial standpoint. The problem in brief is to do away with line shafting which consumes power regardless of work being performed, to be able to use any machine at will, entirely independent of every other machine and using power just in proportion to the work done, including of course a saving in cost of operation over present methods, conveniences and first cost being considered.

While there are several shops using electric motors in this manner, it is to be regretted that so little actual information can be obtained concerning the cost of operation as compared with the out of-date but very useful line shafts which must still be depended on. Considerable has been written on this work, and pamphlets have been issued which show the advantages of the system; but when shop managers apply for estimates of cost of running and other definite information that must be well considered before making such a change as the abolition of line shafting involves, the necessary data and guarantees cannot readily be obtained. We know of several instances where this change has been or is being seriously considered, and if the desired information could be obtained and prove satisfactory, the adoption of electric motors in various parts of the shop would immediately follow. We will not go into details as to the advisability of grouping light machines to be driven by one motor, or of putting independent motors on each machine, although this depends upon the size of machines and other circumstances, but the main thing is to secure a definite idea of cost of operation, as well as first cost, because few shop managers care to make such costly experiments with so much uncertainty as to results. We believe this system is coming, and hope to see the many obstacles removed which prevent its immediate adoption. —[Machinery.

New President of the Illinois Steel Co.

The presidency of the Illinois Steel Co. was resigned by Jay C. Morse about two weeks ago, and last week Friday was offered by the board of directors to John W. Gates, who accepted and took charge on Saturday. Mr. Morse, who has been connected with the company since its formation and its president since 1891, has been in indifferent health for some time and has wished to be relieved of the labor of the office. He remains a director and becomes chairman of the executive committee, a position formerly held by O. W. Potter, the duties of which are comparatively light. Mr. Gates has been general manager of the Consolidated Steel & Wire Co. He resigned that office when he decided to associate himself with the Illinois Steel Co., in which he became a stockholder not long since. Mr. Gates has lived in Chicago four years. He is widely known in the iron and steel trade and in financial circles, and has figured prominently in St. Louis, where he laid the foundations of the Consolidated Steel & Wire Co., the extensive manufacturers of barb wire and wire nails.

THE Walburn-Swenson Co., of Chicago, have just begun the manufacture of brass castings used in the machinery and materials they manufacture. Heretofore they have had all their brass work done outside. Their first brass casting was poured last week Friday and was a success in every way. A note from the works of the company at Chicago Heights informs us that it "turned out sound and clean throughout." This first casting was one of the largest ever made in Chicago, weighing over 1,600 pounds. It was one of several that will be made by the company, for the heads of dye tanks for an Eastern concern.

THE strike at the Round Oak Stove Works, Dowagiac, Mich., resulted in a pitched battle between union and non-union men last week Monday, in which several of the workmen were seriously injured. The trouble was caused by the action of the company in employing non-union workmen.

JUGGLERY IN TESTING CAST IRON.

BY THOS. D. WEST.

The article "Physical Tests of Cast Iron," which appeared in the last issue of *The Iron Trade Review* from the pen of a Western foundryman, was one which should greatly assist in emphasizing the necessity of using round test bars cast on end. The tests presented show a uniformity which certainly recommends the system which he has used. The difference in his first four tests between the greatest and smallest load is but 82 lbs.; in the second test, but 52 lbs. In his tensile test, we find in Bessemer iron three of the tests vary but a few hundred pounds, and why one test in this series should pull about 6,000 pounds more than the weakest bar is an element which requires investigation and probably experiments to find the cause for such a difference. If the bars had not been turned to remove their crust or surface involving elements of strain, the writer would have said that the difference might have been caused by some little fin or gate, or a swell at the top of the other three bars interfering with the freedom for contraction which should exist in casting bars on end. The writer has in his experience once in a while found a bar breaking with a much less load than others cast out of the same ladle. In following this matter up it was discovered that fins would be permitted to run into the joint of the flask or over its top surface at the upper end of the mold. This would cause a test bar in contracting, instead of its weight causing the bar to pull itself downward, to lift itself up bodily from the bottom of its mold so that when the flask would be parted, instead of finding the contraction had left a space at the uppermost cast end, it had done so at the bottom end. All founders experienced in casting rolls, shafting, pipes or cylinders on end have often found that by reason of fins or projections on the upper end of the casting or "riser-heads," castings would have check cracks and in many cases be pulled apart. Such experiences aware that I am still active in pursuit of knowledge on questions involved in testing cast iron, and to sustain my opinion would strongly suggest the necessity of carefully guarding a test bar cast on end against anything which would tend to lift it bodily from its bottom when contracting. We must remember that with molten metal, from the moment it has solidified, commences the action of contraction, a process which continues until the iron is cold. There are certain points in its change from first solidification to the end, in which a bar can have invisible checks or internal strains caused by lifting itself bodily from the bottom of its mold. These, though invisible, must be effective in weakening its strength when a load is applied in testing. The writer has presented these suggestions as of some import in assisting to find the cause for the one bar out of 16 showing such a radical difference from the 15 tests which are above criticism as far as commending the system used by the Western foundryman in obtaining his test bars, and recording their strength, and also present ideas which may assist others in testing rough bars cast on end. In a study of the greater strength shown by the foundry iron, compared with the Bessemer iron, the writer is led to believe that if a chemical analysis were taken of the two different mixtures, the foundry mixture would show itself to be higher in sulphur or lower in silicon than the Bessemer, hence the greater strength found in the test bars from the foundry mixture.

The series of tests would certainly prove that test bars can be obtained perfectly solid when cast on end, a point which some have questioned. I was pleased to notice that tensile as well as transverse tests had been taken, and while there are those who would affirm that the relations of these two tests are too erratic to be relied upon, I have every faith that the future will demonstrate that either form of tests will indicate very closely what would be found of the other when tested, mainly for the reason that testing bars cast on end to obtain the tensile strength afford much more favorable conditions to obtain an even strain over the whole area of a bar. Just imagine a tester being careful in setting his specimens between the testing machine jaws, etc., to secure a uniform pull with a specimen that has one side of its area much stronger than the other, as is the case with all bars cast flat. Is it any wonder that past comparisons have been so wild in drawing the relation between transverse and tensile test, and that engineers and founders have good cause to open their eyes to

the evils of casting test bars flat and acknowledge the absolute necessity of following the practice of casting test bars on end?

While I am unable to even surmise the identity of the Western foundryman, it would appear from his article that he was aware that I am still active in pursuit of knowledge on questions involved in testing cast iron, and to sustain his opinion I will take this opportunity to set forth some results obtained as new discoveries, and which should again do much to demonstrate that there is only one proper way and form to follow in testing the physical properties of cast iron.

At the last meeting of the American Society of Mechanical Engineers held in New York City, the week of Dec. 3, 1894, the writer in a discussion on testing, briefly called attention to the following series of tests which are now for the first time published in any technical or trade paper. Before asking the reader to review the tests the writer would comment on the principles involved and what they demonstrate to us, in emphatically proving that certain practices followed today are not honest to record tests. It is well known that the past practice in molding test bars has been upon the principle of casting them flat, and also that the form generally used has been a square or rectangular one, as against the round form cast on end, which the writer is pleased to note has attracted much attention and is now being adopted by many as a method to test the physical properties of cast iron. The writer will now advance more proofs to show that the round test bar cast on end is the only method which we can adopt to obtain correct knowledge of the natural or relative strength of cast iron, and to reduce erratic results in testing to the minimum.

Several months ago the writer discovered that in testing a bar cast flat for its transverse strength, by applying the load

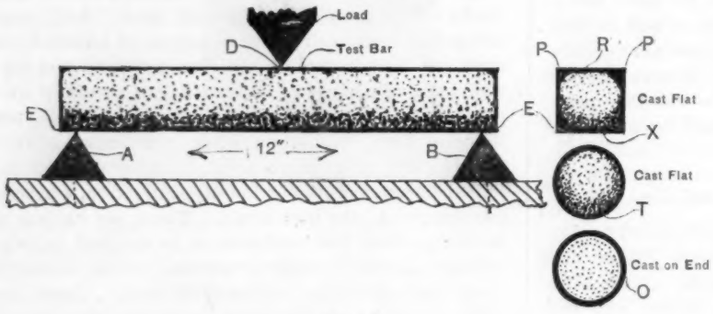


FIG. 1.

FIG. 2.

on the upper cast surface a much greater strength could be obtained than if the bar was turned the reverse side up. I have found in experimenting with a large number of bars ½″ square, 1″ square, and 1⅛″ diameter, with supports 12 inches apart, that I obtained on an average 30 pounds more strength for a ½″ square bar, 100 pounds in the 1″ bar and 150 pounds in the 1⅛″ round bar. I wish these figures to be taken only as coming from an average from many tests in the respective sizes given and with which as a principle the results have been very erratic.

I have found in a ½″ square bar as much as 50 pounds difference in testing the two sides and in the 1″ square and 1⅛″ round I have found a few bars to give as much as 300 to 400 pounds of a difference, thereby presenting proof that casting flat any form or size of a bar admits of jugglery and is wholly wrong.

I would state here that in experimenting with testing on the lower and upper side of test bars, they should be always molded in the same flask, poured out of the same ladle and from the same gate. To prove my position on this question, I would first call attention to conditions which can be found by any who are sufficiently interested to experiment in this line. In Fig. 1 is shown a side elevation of a bar resting on pointed supports A B, 12 inches apart, the distance which the writer used in his experiments. The point of load is shown at D. The position of the bar is the same as when cast or lying in its mould. In examining such a bar, it will be found that the metal at the lower side or shell E E is generally denser or of a closer grain than that composing the upper half of the bar. This is caused by the lower half being chilled quicker than the upper half. This gives in the lower half of the bar, in a sense, more combined than graphite carbon, which results with iron not "white" in causing the lower half to be of greater strength than the upper half. But the degree to which this is affected in flat-poured bars is largely controlled by the difference in the "temper" of the sand, hardness of ramming, degree of fluidity, speed of pouring, and the quality of iron used. Since it is impossible to have these conditions always the same, results in testing are erratic. That one side of a bar will always be in line of giving more strength than another is readily understood when we take into consideration with the above, the fact that in testing for transverse strength, we subject the underside of the bar to an extension or tensile strain, and the upper side to one of compression or crushing. In the latter, if we have the densest or highest combined carbon side of a bar to resist the extension or tensile strain, it is reasonable to expect it to stand a greater load than if we placed the most open-grained or weakest side to the extension or tensile pull. Another point which proves that there is a difference in the cross sections of the grain of iron in a test bar poured flat, is that if we drill into the end of such bars there will be found, as a general thing, a tendency for the drill to work itself more to the top or weak side of the test bar, as more clearly illustrated in Fig. 2. I cannot conceive why the adoption of the round bar cast on end, should not greatly lessen the causes for the past erratic results in testing, as my experience with these bars so cast makes it manifest how closely two bars of like area which have been properly cast on end, in the same flask, with the same gate and out of the same ladle, will come to each other. Table 4 is an example of how closely round bars cast on end can record like strength.

Below I would call attention to the test of 12 bars, comprising four ½″ square, four 1″ square and four 1⅛″ diameter, which were all molded in one flask, poured with the same ladle from the same gate and cast flat. There are also shown four 1⅛″ round bars, which are molded two in a flask, upon the principle which the writer advanced for casting test bars on end. These were cast out of the same ladle after the above twelve bars were poured flat. The ladle for pouring the above sixteen bars held about 150 pounds of metal. It will be seen by the examination of the tables 1, 2 and 3, that all the bars cast flat stood the greatest load, with their side which was down when cast being in extension when tested, and also that the greatest difference in this respect exists in the round bar. Again I would call attention to the fact that the results in all the flat cast bars were very erratic. This table compares very closely in averages with a large number of tests which I have made on this point to satisfy myself as to the correctness of such results, and they always point in one direction.

A deceptive point which it might be well to notice in casting test bars flat, is the chance it affords to make a test bar record too great a strength for an iron. Take a round bar cast flat and test it with its side cast down in extension, or as illustrated in Fig. 1. You can record a greater strength than by any other method of casting; but where one desires to record the honest and natural strength of an iron, he should use the round bar cast on end. And by a comparison of the round bar cast on end with those cast flat as seen by Tables 3 and 4, the system which the writer advocates is found to be one which will not permit a tester to obtain a greater strength than that which the iron truly possesses nor admit of any jugglery in recording tests. When it is known that one side of a flat cast bar can often give 300 to 400 pounds more strength than its opposite side, there is surely an opening for deception and variable results.

The mixture of iron charged was all pig metal of the above

analysis. The analysis shows the silicon to be reduced 10 points and the sulphur raised 20 points, by remelting the iron. This, according to the writer's record of the past three years' experience in following this element shows a fair average and would lead him to say that with fuel below .80 in sulphur, which is the general percentage found in coke, and with proper conditions in melting, as a general thing sulphur is raised twice as much as silicon is lowered in remelting iron.

TABLE 1.—TRANSVERSE TESTS OF ½" SQUARE BARS CAST FLAT.

No. of test.	Mode of testing.	Microm't'r measurement.	Deflection.	Broke at in lbs.	State of fracture.	Strength per ½" sq. in lbs.
1.	Top up	.504	.180	264	Sound.	260
2.	"	.509	.170	260	"	251
3.	Top down	.493	.160	240	"	233
4.	"	.526	.110	160	Small flaw	145

Difference in strength extremes, 27 lbs. or 11.59 per cent.

TABLE 2.—TRANSVERSE TEST OF 1" SQUARE BARS CAST FLAT.

No. of test.	Mode of testing.	Microm't'r measurement.	Deflection.	Broke at in lbs.	State of fracture.	Strength per sq. in. in lbs.
5.	Top up	1.022	.110	1784	Sound.	1709
6.	"	1.052	.120	1820	"	1645
7.	Top down	1.044	.120	1764	"	1618
8.	"	1.024	.100	1600	"	1526

Difference in strength extremes, 183 lbs. or 11.99 per cent.

TABLE 3.—TRANSVERSE STRENGTH OF 1⅛" ROUND BARS CAST FLAT.

9.	Top up	1.161	.160	2128	Sound.	2010
10.	"	1.140	.150	1980	"	1940
11.	Top down	1.171	.140	1996	"	1853
12.	"	1.131	.100	1682	"	1674

Difference in strength extremes, 336 lbs , or 20 7-100 per cent.

TABLE 4.—TRANSVERSE TESTS OF 1⅛" ROUND BARS CAST ON END.

	First flask.					
13.	Cope side	1.111	.110	1760	Sound.	1815
14.	Nowel side	1.116	.110	1772	"	1812
	Second flask.					
15.	Nowel side	1.132	.111	1772	"	1761
16.	Cope side	1.121	.110	1720	"	1743

Difference in strength extremes of two flasks, 72 lbs., or 4 13 per cent, but the greatest difference in one flask, tests Nos. 15 and 16, and which is the way this table should be shown, is but 1.03 per cent.

Tested by Thos. D. West, Oct. 23, 1894, assisted by C. B. Kantner, at the works of the T. D. West Foundry Co., Sharpsville, Pa.

TABLE 5.

Chemical analysis of pig iron charged.				Chemical analysis of test bars.			
Silicon.	Sulphur.	Mang.	Phos.	Silicon.	Sul.	Mang.	Phos.
1.48	.019	.35	.097	1.38	.038	.31	.099

A study of the above tests shows that the greatest difference in one flask of the strength extremes of the bars cast on end is 1.03 per cent compared with 11.59, 11.99 and 20.07 per cent found in the bars cast flat. It may be well to mention again the fact that all the bars were poured out of the same ladle and that the flat cast bars were all molded and cast together in one flask, giving them a much better chance to be uniform than the bars cast on end, as the latter were cast in separate flasks. When you can get a system that with two bars will show only three pounds of a difference in their breaking loads per square inch, as is found with tests Nos. 13 and 14, the writer has a suspicion it is about time the tomfoolery many practice in testing gave place to common sense. The difference of 72 pounds between the two flasks poured on end is due to the difference in the fluidity of the metal which existed through lapse of time in pouring the two molds. All experienced in testing know that varying degrees in fluidity of metal produce varying degrees in the strength of a test bar.

The method followed by the Western foundryman whose report was given in the last issue of *The Iron Trade Review*, in measuring his test bars by micrometer rule and reducing the same to strength per square inch, shows his appreciation of the necessity for such a course. Those not used to this practice would be surprised at the difference a few thousandths of an inch can make in raising or lowering a record when it is reduced by figures to strength per square inch. In order to know anything definite about what changes different mixtures, etc., may make in iron, it is absolutely necessary that micrometer measurements should be taken, as no two bars can be cast the same size. In fact, one who will not take micrometer measurements, might often almost as well break his bars with a sledge hammer to judge of their strength. What is worth doing at all in testing must be done well before any value can be attached to the records obtained.

Another point which it would be well to call attention to here is the question of what record should be accepted from a test of two or more bars. With bars cast on end the writer would advise always recording the strongest test only and not taking an average of several bars as has been found necessary with bars cast flat owing to the great differences in results. Two bars properly cast on end will generally show but little difference, and hence the advisability of always accepting for record the best strength of a single bar, which saves labor in figuring averages, etc. Testing of cast iron involves much more science and intelligence than has generally been accorded it. The day is not far distant when all will recognize that to obtain a relative knowledge of the true, natural physical qualities of cast iron for a universal comparison, not only must a round bar cast on end be used, but also the same plan of molding, design of flasks, and other details be carefully followed; and further, that the work calls for more intelligence and discrimination than are possessed by any block-head that can pound sand.

Uses for Old Rails.

In speaking of the uses of old rails recently, a well-known official of the Pennsylvania Railroad said: "The life of a rail on the Pennsylvania lines West is about eleven years, and on the Pennsylvania Railroad only nine years. The difference is perhaps due to heavier traffic on the Pennsylvania Railroad. The friction of constantly passing trains wears on the rail until it must be replaced by a new one. The company pays $24 per ton, [now $22] and the rails used on our line average 85 pounds to the yard. When it has passed its useful stage the rail is replaced. The old rails that are taken out from time to time are gathered up every month, and sold to junk and scrap dealers at $12 per ton. It can readily be seen that the company pays only $12 for the use of rails per ton. The price received from the scrap man is a good figure, when it is known that the rails, when sold, are of no use to the company. Rails that are not much worn are sold to factories along the road at $18 per ton, where they are used for sidings, and answer the purpose quite as well as new rails. There are many uses to which the old rail is put. A great amount of barb-wire fencing is made of railroan iron, and very often the rails are used as foundations for large buildings. There are not many people who know that the Masonic Temple in Chicago rests on a foundation of steel rails, layer upon layer, six feet deep.

English and American Costs of Conversion.

It is astonishing how very low the cost of producing steel ingots and rails, in the item of labor, has now fallen, owing to the economies effected in the matter of labor-saving machinery and improved methods of working. It will hardly be believed that in Great Britain the labor cost of producing a ton of steel ingots, whether at Bessemer converters or open-hearth furnaces, does not exceed 4s. per ton, and in the best practice is probably not much over 3s. The chief items are pig, steel, scrap, coal, and ferromanganese—the total cost varying from £3 6s. to £3 10s. per ton. In the United States, although wages are nominally higher, the cost is not greatly different.—[London Iron and Coal Trades Review.

A FINE lathe has been added to the equipment of the machine shop at Case School of Applied Science, Cleveland. It was made by the Ballou Mfg. Co., Hartford, and is intended for light and accurate work, having special features which adapt it to these uses. The tool carriage is unusually complete in its adjustments, so that the lathe can be used as a small milling machine. Besides the regular feed screw, it is provided with a precision screw for cutting accurate threads. A feature which makes it especially valuable, is the complete set of gears for cutting threads from eight to 240 threads per inch, and also gears for metric threads from four to 120 per centimeter. All the adjustments of the lathe are provided with graduations, indicating thousandths of an inch, which permit accurate settings. Small chucks, saws, tools, and tool holders are with the lathe.

WESTERN FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Western Foundrymen's Association was held Wednesday evening, March 20, 1895, at the Great Northern Hotel, Chicago, Mr. Geo. M. Sargent, the President, in the chair.

Among those present were the following: George M. Sargent, W. D. Sargent, the Sargent Co.; S. T. Nicholson, Aermotor Co.; A. Sorge, Jr., F. Stumpf, Fraser & Chalmers; E. J. Fowler, L. P. Tweedie, Fowler Foundry Co.; H. L. Hotchkiss, Deering Harvester Co.; M. G. Bastues, J. W. Reedy Foundry Co.; A. M. Thomson, Link-Belt Machinery Co.; Jas. Fyfe, Pickands, Brown & Co.; D. L. Cobb, Sloss Iron & Steel Co.; W. H. Rooney, Wells & French Co.; L. W. Lukens, Illinois Malleable Iron Co.; J. H. Dalton, C. S. Thomson, H. S. Ringi, Walburn-Swenson Co.; W. C. Waterbury, Forster, Hawes & Co.; S. T. Johnston, Whiting Foundry Equipment Co.; H. S. Vrooman, Garden City Sand Co.; John Meehan, Lake Shore Foundry Co.; Ed. Welch, Wier & Craig Mfg. Co.; W. M. Wilson, S. Obermayer Co.; Norman Speight, Vierling, McDowell & Co., and O. W. Holmes, Holmes, Pyott & Co., all of Chicago; E. H. Walker, Emerson, Talcott & Co., Rockford, Ill.; A. W. McArthur, Rockford Foundry Co., Rockford, Ill.; John Bailey, Illinois Iron & Bolt Co., Carpentersville, Ill.; A. W. Blair, superintendent of the C. M. & St. P. Ry. foun'ry, West Milwaukee, Wis.; C. A. Sercomb, Schwab & Sercomb, Milwaukee, Wis.; F. M. Lyon, Burlington Route Foundry, Aurora, Ill.; E. E. Walcott, Bates Machine Co., Joliet, Ill.; John A. Penton *The Foundry*, Detroit, Mich.; B. M. Gardner, *The Iron Trade Review*, Chicago.

The Secretary presented the following applications for membership, and the applicants were unanimously elected members of the Association:

The Crane & Breed Mfg., Co., Cincinnati, O.; Illinois Iron & Bolt Co., Carpentersville, Ill.

The Secretary read the following letter:

"RACINE, WIS., March 3, 1895.

"B. M. Gardner, Secretary Western Foundrymen's Association, Chicago:

"DEAR SIR: If it is not out of order, I would like to say a word in regard to the melting of cast iron turnings or chips, which was discussed at your last meeting: The most successful manner of doing this that has come to my notice in practice, is to charge the turnings or chips in old kegs or boxes which are strong enough to stand handling. You will find that they will be delivered nearly to the melting point of the cupola intact and have a tendency to go down as one piece.

"Yours very truly,

"J. W. DEARSLEY."

The President announced that the subject of the evening would be "Cost Sheets."

The Secretary reported having received several blank cost sheets and two or three letters from foundrymen relative to this subject and describing the manner in which they keep their costs. One is a short article from Mr. Herbert M. Ramp, as follows:

"Mr. B. M. Gardner, Sec'y Western Foundrymen's Association:

"DEAR SIR: The question of estimating or keeping cost in the foundry is one of no mean importance, and frequently work is taken based wholly on supposition, which may possibly be correct, but often through unforeseen mishaps, constitutes a price too low. Often after a contract is filled it is impossible to tell whether money was made or lost, on the individual contract.

"For several years past I have been using the following method: A record is made every day of the work each molder produces, the number of castings, kind and weight; a record of the bad work is kept in an opposite column, at the end of the month giving the average of bad castings against each molder and grade of work, and total amount made. This record furnishes a very accurate guide to figure the actual cost of molding. The other expenses of the shop are averaged at so much per ton, except core-making, which is considered in a similar manner to molding. An estimate is made on cost of iron and fuel per ton, according to grade, and charges made accordingly. HERBERT M. RAMP."

The second letter, unsigned, is as follows:

"Western Foundrymen's Association:

"GENTLEMEN: All material used in the productions of castings and wheels, such as pig iron, sand, facing, limestone, coal, coke, wood fuel, etc., is inventoried monthly. All costs of operating and management, no matter of what description, are absorbed monthly into cost prices of castings. Patterns and flasks are not taken into consideration as an asset, except in the case of metal patterns, which are charged by weight to new patterns at their scrap value, the balance of the cost being absorbed in the price of the castings produced. Therefore we have no large patterns account on our books, and metal patterns when scrapped being only of value of scrap, we have no fictitious assets in this particular.

"Our time is distributed according to class of castings made, and the various descriptions being weighed coming from cleaning room, we can always tell at the end of the month what our freight, passenger and miscellaneous castings cost, either hand or machine molding.

"We have daily melting reports, but do not rely upon these more than as a guide in case of any large discrepancy with our monthly inventory showing, as we charge up all disappearances. This has been a great help, as we have no large shortage or average to face at the end of our fiscal year, and the plan has worked admirably.

"Our brass foundry is inventoried every month. Issues from brass stock room are debited to this department and the proper credit given for material on hand, so that we can tell exactly what our brass foundry costs are.

"The costs of wooden patterns and flasks are absorbed into the cost of the castings, and are not ranked as an asset. All work done by outside departments, such as repairs of buildings, repairs and replacements of machinery and tools, are charged up monthly and absorbed into costs according to the department in which the repairs may have been made.

"Power is charged against the different departments at a proportion which has been ascertained by long experience to be fair. General expense is charged against departments on an ad valorem basis and all charges are wiped out monthly. In fact we charge up everything monthly against costs with the exception of the scrap value of metal patterns as before noted.

"I might add that our labor distribution is so arranged as to show cost of molding, core-making, melting, charging and the many segregations of charges that occur in manufacturing concerns. This remark applies also to miscellaneous material, such as flour, and other issues from the store room which are made on requisitions only, and charged up at end of month on 'abstract of requisitions.' Very respectfully,

"* * * *"

The third letter is as follows, and is unsigned:

"Western Foundrymen's Association:

"GENTLEMEN: We have received your circular letter of the 8th inst., in regard to method of ascertaining cost of foundry output, and wi l endeavor to briefly explain our system as follows:

"At the outset, you will understand from the nature of our business (manufacturing agricultural implements) that nearly all of our castings go into the machines manufactured. Our job work, such as making and repairing flasks, patterns, jigs, etc., together with general repairs about the plant, is run with our regular work, and therefore the material for all of our castings is placed on the same cost basis.

"*Material.*—We have the following material accounts: Pig iron, scrap iron, coal, coke, sand and supplies. The latter account includes fire brick, pails, shovels, flour, rosin, and other miscellaneous items of minor importance. These accounts are charged with the purchases of the year, and, figured with the inventories which we take at the end of each season, give us accurately the amounts to be charged to the cost of good castings made. We use a card system of cupola charges and the weights taken from these cards are entered in an especially ruled book; the recapitulation of the monthly footings of this book gives us the exact amount of material used for the season.

"*Labor.*—All of our machine castings are made by piecework. We have a book ruled especially for this work, in which the time-keeper each morning places to the credit of each molder the number of castings made the preceding day, as determined by actual count, a column being reserved for each different kind of casting. At the end of the month, the footings of this book are transferred to the accounts of the respective molders in our departmental piece-work book, and

the imperfect castings chargeable to each molder are transferred from what we term our 'Foundry Waster Book,' and deducted from the total amount of castings made, the molder being paid from the remaining good castings. These accounts are posted into a book called 'Summary of Day and Piece Work,' from which we get our final footings for cost of season's work. The amounts paid to day-laborers and jobbers are also entered in the latter book, hence at the end of the season we have all the day and piece-work entered against the respective accounts.

"We have accounts with the following headings that belong distinctively to the foundry: Labor on Machine Castings, Cores, Cupola, Tumbling Barrels, Gangway, Test Bars, Unloading and Handling Pig Iron, Sand, Coal and Coke, Foreman's Salary, Labor Charged to Foundry by Other Departments, etc. Thus we have year by year, the exact cost per ton for each of the above items.

"We also have an account with chipping and cleaning castings, independent of the above, which added to cost of foundry labor and material, gives us the cost of castings delivered to machine shop. As we figure the castings at so much per ton, based on the amount put into our machines, we might explain that we keep account of the weight of castings as follows: Castings found to be defective before reaching the chipping room are returned to foundry, and charged to either the molder, tumbling barrel or foundry, as decided by the foundry foreman. These are weighed separately, so that we can tell the amount poured any day, and what per cent of same went into the machines. These records are entered daily, and we have a final recapitulation at the end of the season.

"Each morning the time-keeper gets the weight of castings judged good by foreman of chipping room. These amounts are added each month and posted to a recapitulation page in 'Day and Piece Record Book.' At the end of the season, the castings broken or spoiled in process of construction of machines are deducted, and we thus have the net weight of good castings made. The weight of each pattern, flask, or job casting is placed on day-slip and charged to its respective account, and the totals of these accounts are brought together in final cost book. We can thus tell the cost of any tool, pattern, flask, or other casting made by us; and we find that in a plant of this kind no idea, even approximately, can be had regarding the cost of patterns, jigs, etc., unless such a system is kept.

"Having in the foregoing endeavored to describe our system as clearly as possible, we will present the following statement of our last year's final footings and cost (with figures changed):

LABOR ON 10,000 TONS OF MACHINE CASTINGS.

Molding	$45,888.00
Core work	9,344.00
Cupola	3,228.00
Tumbling	2,452.00
Gangway	4,092.00
Test bars	248.00
Handling pig and scrap iron	280.00
Handling sand	272.00
Handling coal and coke	128.00
Charges against foundry by other dep'ts	314.00
Foreman's salary	3,000.00
	$59,256.00
Labor in chipping room	8,520.00
Total cost of labor	$77,776.00

MATERIAL.

Pig and scrap iron	$80,784.00
Sand	3,052.00
Coal and coke	7,128.00
Supplies	3,164.00
Total cost of material	$94,128.00

RECAPITULATION.

Labor, foundry, per ton	$6.93
Labor of chipping, per ton	.85
Material, per ton	9.41
Total cost per ton of castings	$17.19

"You will doubtless have observed that no mention has been made of wear and tear on buildings, machinery and equipment, repairs to flasks, patterns, benches and tools, insurance, taxes, motive power, light, etc. Our foundry being but one of the many departments of our plant, we have what we term 'Accounts Proportioned,' or in other words, accounts not properly chargeable to any one piece or machine. Some of these accounts are—tool repair, machinery and equipment, hauling and handling merchandise, salaries of superintendent, foremen and office help, insurance, taxes, motive power, steam heating, repairs to buildings, and shrinkage (a fixed per cent being deducted each year) on tools, flasks, patterns, jigs, etc. The total of these accounts is pro rated on machines, etc., so that we know what percentage to add to the cost of our output in any department for the above items.

"Trusting that it may be of some benefit to the members of the Association, the above is respectfully submitted."

"* * *"

The blank cost sheets sent in were passed among the members and looked over by them.

Mr. Sercomb: I take exceptions to the first communication read. I do not think that plan would cover the matter of running expenses. It seems to me when we know the cost of the iron we should know the cost of the molding.

Mr. E. H. Walker: Our method of keeping costs is somewhat similar to one of the cost sheets shown by the secretary, and it is very satisfactory to us. Our costs are determined monthly. We do no outside work that amounts to anything, what little we do goes right in with our regular work. We charge up to the foundry everything that is taken into it. In our case we have never considered it necessary to keep the core account separate.

Mr. A. Sorge, Jr.: I have not seen among the methods for keeping costs shown any that would cover the ground for an establishment such as Fraser & Chalmers, the reason being that these sheets are all based on making only one distinct line of work, while with us there are hardly two pieces alike. Our method consists principally in issuing with each pattern a ticket, the tickets being of ten different colors, each color referring to the distinct line of work, such as pulleys, mining machinery, steam engines, etc. As these tickets are issued with the pattern, the molder is required to put on the back of the ticket the time which he spent on this work until it is finished. He is also required to put on the time of each helper. In the same way the tickets are issued in the core-room. In the evening each molder is required to hand in with his time check his ticket. These tickets are kept by the time-keeper where the work has been completed, but where the work has not been completed he hands it back to the molder. He tabulates from these tickets the castings that have been made the day before. No ticket is retained by the time-keeper until the casting has actually been made. If a defective casting is found in the cleaning-room the shipping-clerk issues another order on the foundry to replace the defective casting. That goes through the same process The time-keeper draws from these tickets, and not only do they check the man by his time check, but their tickets must show a day's work. The time-keeper foots them up and draws off a list which he hands into the shipping-clerk in the cleaning-room. This is a full statement of every casting that was made. The shipping-clerk makes out his manifest and delivers the tickets to the different departments. The time is then drawn off on a general sheet from these tickets. We put in the number of hours spent opposite each man's name for each day in the week. At the end of the week these are drawn together. At the end of each four weeks these are drawn together again. We do not pretend to separate each casting, but if at any time I should want to know what the cost of any particular casting has been, I can refer back to every moment spent on it. We keep an accurate account of every material that is used. We do not permit an ounce to be charged in the cupola that is not weighed. If we receive a carload of iron of any kind we pile that carload by itself. At the end of the four weeks we draw up a general statement of the labor classified according to the color of the tickets and then we draw that together again. In making up the general account of labor we separate the molding and core-making and the question of loading and unloading the cars. Then the cost of material we put in according to what we paid for it and draw them together for a total. In that way we get the total amount of material used, the total amount obtained from the cleaning-room. These are drawn together at the end of every week according to the different classifications and at the end of the four weeks drawn together again, giving us the total product during the four weeks, and labor during the four weeks.

We have a force of 160 men and one time-keeper and one shipping-clerk in the cleaning room. The castings are delivered from the cleaning-room. The time-keeper does not individually separate the cost of each mold; but if I want to

know what a certain casting cost, I can refer back and find those tickets and tell by them exactly every hour and every minute that each man in the foundry has spent on that work. M lyast monthly report showed 1½ per cent of bad castings.

Mr. Rooney: The corporation with whom I am working does a different class of work and I do not think that system would be adapted to our work. One day we have one line of work and another day an entirely different line and the requirements are various and the system has to be changed according to the work. We separate our gray iron castings into two classes and I endeavor to keep them entirely separate.

Mr. Nicholson: Our keeping of accounts is similar to Mr. Sorge's. We do it according to the ticket plan. Our work is very simple, most of it piece work. We keep account of the material and labor. We can tell just what a piece has cost us. We get the cost each day. There is only trouble when a man works two patterns at the same time.

Mr. Bair: Our laborers are all kept separate, our molders are all kept separate. At the end of the month the cost of melting, cost of molding and miscellaneous expenses are drawn up for the month and percentage of all bad castings turned out during the month. We have one time-keeper in the foundry and he keeps all the laborers' and molders' time and everything of that kind.

Mr. W. D. Sargent: I think our system conforms very closely to Mr. Sorge's, except that our time-keeper takes a separate card for each piece of work. In other respects it is just about the same thing. I do not see how you can keep a foundry cost-sheet unless you classify the accounts very carefully. It goes without saying that it is a very important matter and a matter in which one is very easily led astray The only way to succeed with keen competition is to keep a careful cost-sheet.

Mr. McArthur: Our work is jobbing. It is necessary that we know the average cost of each particular casting. Our system is a little different. The work is all done by the time keeper and the clerk in the office opens a ledger account with job in the foundry. A man orders some castings; that is made a ledger account. The time is posted against the job each day. When iron is delivered the weight is taken from the general book and the weight is charged up against the general account at the cost of iron that day. We can tell at a glance whether we have made or lost money on a job. There are some cases in our foundry that are divisible, such work as tumbling and cleaning up the gangways. We keep track of that in this way: We take the total of all the money paid out for that class of work a month and divide it by the product affected by that work. Of course the tumbling would not bear against anything that is not milled. We can turn back at any time and find out what it cost to make a set of castings and we have a very good basis in competing on any other work in the same way.

Mr. W. D. Sargent: The molding and core making are the items that show the greatest variation. In the system of cost keeping gotten up by a German, named Messersmith, he took in the first place the molding and core making; all the other expenses were divided in proportion to the molding and coring. If the casting cost five dollars for molding and core making, and the other foundry expenses were ten dollars, the casting would cost eight dollars. The point is that the other expenses were really borne in proportion to the length of time the casting was in the shop. That system has been adopted more or less generally in Germany. I tried it for quite a while but I did not think it was thoroughly practical.

Mr. Hotchkiss: Our work being of but one class makes it a very simple matter to keep the cost of labor in the foundry. That is about all we do keep there. The cost of each department is figured out every two weeks and turned in on blank forms showing the cost of the foundry at so much per day. We weigh the good castings and the bad castings, and each are passed in by themselves. The difference between the weight of the iron that went into the cupola and that which came out gives the loss of material. The total cost is figured out so much per ton. Each room is separate.

Mr. Bastues: We have a very short way because we cannot keep every piece itemized as people do who make many of the same pattern. Ours run all the way from ¼ of a pound to 40 pounds. We take the average of the first month and at the end of the month we can easily see whether we have made or lost money.

Mr. Thompson: It is a very important thing to tell what a piece of work is going to cost before you start to make it, as well as after you have made it. I referred to the Messersmith system last meeting, and I think we can come very closely to what our castings should cost, provided the foreman of the foundry can estimate the time it will require and the weight, if that has to be guessed at. It does not do to have too many factors to figure from when you are estimating the cost of a casting, and they should be boiled down to about three factors.

Mr. Bailey: As our work is pretty much of one class we simplify matters very closely. We are not quite so trusting as some folks; we do not trust anything to the molder, nor ourselves hardly. It being all piece work we count up the good castings the molder has made. The inspector gives the molder a ticket on the following morning, stating the amount of good castings he has made, a duplicate of that ticket going to the office. It is written on manifold so the office gets the direct duplicate of the one the molder gets. The ticket is his time check. The molder knows just what he is getting for a piece and he tries to get the piece as good as possible. We know what our pig iron costs us and also our coke. We also know from past experience how much coke it takes to melt a ton of iron and we charge the foundry with so much melted iron. It simplifies matters in keeping accounts.

Mr. Speight: Our system is entirely different from anything I have heard so far. It may be that we have not got things down to such a fine degree as some of the foundrymen who go into the small class of work, but I think as a whole, for all practical purposes, we arrive at our actual costs sufficiently well to guide us in making future contracts. One gentleman said here tonight that it is not so much how much this order of work will cost us, as to know beforehand what to estimate it in order to secure the work with profit to ourselves. We have two people to keep track of the accounts. We did try to have one man accomplish that work but his duties were so numerous that we discovered that it was a little more than he could accomplish and be accurate. We therefore divided it into two sections and let the shipping clerk do his share of the work. We provided him with a set of books so that he could keep full account of the arrival of all material and ascertain the cost of unloading and storing the same, which was charged up to the foundry and that account was turned over to the time-keeper at the close of each day's work, so that the time-keeper could attach it to his own sheets. The time-keeper would start out each morning and ascertain the amount of material that was put into the cupola the day before. He would then turn to his time books and learn the number of hours—that is the total number of hours—that the foundrymen as a whole were engaged in manufacturing the whole of the work. To that we add our natural expenses, consisting of insurance, interest, taxes, salaries and such as those which have been totalled up and averaged for that particular purpose. He then takes the cleaning time on the tonnage of work which has been done the day previous. He learns in that way what per cent of castings are good and how much to charge back to the foundry for inferior work. It may be that we are a little lacking in this system, because I am satisfied in my own mind and I have spoken of it, we ought to be able to determine more accurately the actual cost of cleaning that work.

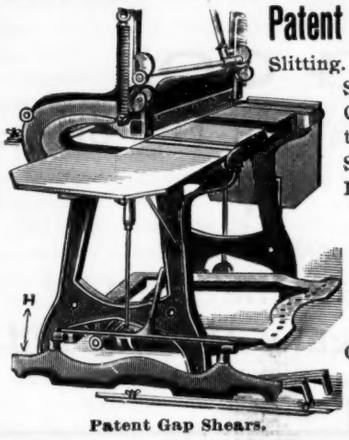
Mr. McArthur: A promise was made by some of our members that they were going to give us the cost of machine molding vs. hand molding.

Mr. W. D. Sargent: We find in making brake shoes that we can do it a good deal cheaper with machinery than by hand. Of course the cost depends upon the tonnage that you turn out. We can turn out on some kind of brake shoes 300 flasks, two in a flask. You have to make special arrangements to run the whole shop. I should think where you made a large number of the same things the cost should not exceed a third. In shops where they have cheap labor I think they come pretty near down to the cost of machine molding.

Mr. McArthur: The cost with us was less than one-half in favor of the machine.

The following was adopted: *Resolved*, That a nominating committee of three be appointed by the Chair to put in nomination at the April meeting three names for each of the various offices to be filled at the annual election in May.

Machines for Working Sheet Metal.



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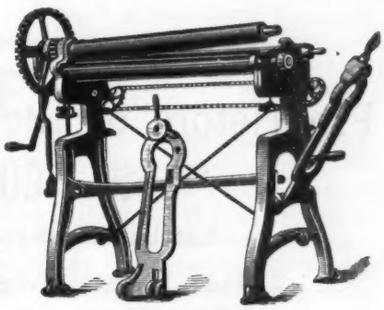
Rear Side.



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INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review* and we will put you in communication with our advertisers at once.]

Hoover & Murphy have started a new machine shop at Wabash, Ind., for jobbing machine work.

H. C. Graves & Sons, Council Bluffs, Ia., want to buy good second-hand vertical boilers, 25 to 30 horse power.

Chas. Truax, Green & Co., 75 Wabash ave., Chicago, want to buy a good second-hand medium size, fast speed lathe.

The F. C. Austin Mfg. Co., Carpenter and Carroll aves., Chicago is in the market for a 20 h. p. gas or gasoline engine.

The H. Mueller Mfg. Co., of Decatur, Ill., is in the market for a 60 h. p. engine, lathes, drop forge, hammer and other tools.

The Courtland Machine Co. has been formed at Baltimore, Md., with a capital of $10,000, to manufacture a general line of machinery.

At Columbus, O., the Toledo Rolling Mill Co. was incorporated by A. W. Houston, J. Lawrence Adams, W. H. Sherman, William F. Duhlmeir and Nelson Saylor. The capital stock is $50,000.

The Union Jobbing Foundry has been started at Reading, Pa., to make machinery castings of all kinds. R. A. York is general manager; Charles Hulser, treasurer; Edward Showers, superintendent.

L. K. Hirsch, 549 The Rookery, Chicago, wants to buy a second-hand rock crusher; must be in first-class condition. Gates No. 3 or 4 or Comet "C" or "D" preferred, or any other make having the gyrating revolving movement.

The Leitch Malleable Iron & Bedstead Co., of Minneapolis, Minn., have incorporated for the manufacture of metal castings and brass and iron work. The capital is placed at $50,000, and the stockholders are Allen Brown, Mathew Leitch and James D. Shearer.

At the office of the Supervising Architect, Washington, D. C., sealed proposals will be received until 2 P. M., April 13, opened immediately thereafter, for furnishing and putting in place complete the second story columns and the third floor beams and girders, etc., in the U. S. postoffice, court house and custom house at St. Paul, Minn. Drawings and specifications may be obtained at the Supervising Architect's office or at the office of the superintendent at St. Paul.

Fires and Accidents:—

Byram & Shiplett's foundry at Abingdon, Ill., has been burned.

The foundry of the H. N. Straight Mfg. Co., Kansas City, Mo., was totally destroyed by fire lately.

The Auburn (Ind.) Foundry & Machine Works burned on March 22, with a loss of $40,000; partly insured.

Additions, Enlargements, Removals, Etc.:—

The Elwood, Ind., Iron Co. is arranging to build an addition.

The McKeesport Supply Co., of Pittsburg, Pa., will build a large addition, to be used as a foundry, and equipped with all modern improvements.

The Clow pipe works, recently burned at New Philadelphia, will not be located at Dennison, O., it is now said, but at Newcomerstown. Details are not settled, however.

The enlargement of the Ellwood, Pa., Gas Stove & Stamping Works, recently taken hold of by Cleveland capital, is under consideration. An additional force has been put on in the foundry.

The H. Mueller Mfg. Co., of Decatur, Ill., recently sold its factory building and is seeking a new location. It manufactures water works and plumbers' supplies and gas specialties, employing 65 hands.

The Warren Foundry Co., of Warren, R. I., in addition to its present business of making stoves and ranges, will engage in the manufacture of general castings. The plant will be enlarged to accommodate the new business.

The Braddock Wire Co., at Rankin, is making extensive improvements, which will give employment to 500 additional men when completed. The company has purchased 4½ acres

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Our large capacity, 8,000,000 annually, and modern plant, enable us to handle contracts of any size promptly.

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of ground and will erect thereon a steel plant, machine shop and galvanizing works. The latter is well under way.—[Pittsburg Times.

The Kelly & Jones Co., of Greensburg, Pa., manufacturers of iron and brass pipe fittings, will begin work soon on an addition to their plant, 200 x 40 feet, with a wing midway, 23 x 40 feet, to be devoted exclusively to the manufacture of iron valves. At present 500 men are employed; the addition will give places for 125 more July 1. The company has just installed a Craig Ridgway & Son's crane, and among other equipment ordered is a radial drilling machine and boring mill from Bement, Miles & Co. Another boiler and engine will be added. The new department will give facilities for handling heavier valves than are now made.

The Goulds Mfg. Co. has just begun the erection of an addition to its extensive works at Seneca Falls, N. Y. The building will be a modern structure of the slow burning type. Its length is 86 ft. and width 35 ft. The frame work, beams, columns and roof truss will be of steel. The building will be two stories in height with basement for storage of castings. The main room for heavy machines and erecting purposes will be 22 ft. high and served by an electric bridge crane of 10 tons capacity. The gallery will divide one side into two stories for lighter machine tools. The walls will be of brick, while the skylight and upper windows will be glazed with ribbed glass. The entire main floor is designed to stand a uniform strain of 400 lbs. to the square foot, although a limited area is capable of bearing 600 lbs. to the square foot. It is expected that the building will be completed about June 1.

New Construction:—

The Mackinaw Railway Co. will erect shops at Van Wert, O.

Peter Lamoreaux is erecting a foundry at Owatonna, Minn.

The New Castle (Pa.) Wire Nail Co. will soon erect a large warehouse.

Zahnizer Bros., of Washington, Pa., will erect a blacksmith shop 40x50 feet.

The Roanoke (Va.) Machine Works are erecting a new foundry for general work.

The Griffin Car Wheel Co., of Chicago, has broken ground at Denver, Col., for its branch wheel foundry.

The Ohio River Sheet & Tin Plate Co. will erect a tin plate plant at Remington station, on the P., Ft. W. & C. Road, near Rochester, Pa.

The Hill Foundry & Machine Co., Anderson, Ind., has let contracts for the rebuilding of its foundry. The present one will be torn down April 1.

The McKeesport (Pa.) Supply Co. will build a large addition to its plant, with a modern foundry equipment. The company makes a specialty of high-class castings.

An Athens, O., dispatch says that G. H. Holliday an Ironton, O., stove foundryman, is endeavoring to form a $30,000 company at Athens to build a stove and range works.

Railroad surveyors have run lines for large sidings at the New Castle Steel & Tin Plate Co.'s mammoth new works. Work on the buildings will be well along by the latter part of May.

The Youngstown Bridge Co., Youngstown, O., has been awarded the contract for the structural steel work of the new Lafayette Square Theatre, at Washington, D. C., which will be among the finest in the United States.

The Parlin & Orendorff Co., of Canton, Ills., manufacturers of plows, have recently bought what is known as the "College Square" property in that city, and will utilize it for an extension to the present plant. This tract contains two and a half acres of land, and lies between the present plant of the company and the C., B. & Q tracks. It has not been decided fully what buildings will be erected this summer, but work will be commenced on at least part of the new addition within a short time. The company has completed arrangements for the sinking of a 1,500 foot well which will supply the works with water. The present plant of the Parlin & Orendorff Co. amounts to a value of $2,500,000, and this will be increased considerably by the improvements contemplated.

General Industrial Notes:—

Penn Iron Works, Lancaster, Pa., started up March 11.

Norton furnace, Ashland, Ky., will probably blow in April 5.

A large cupola will be erected at the Claire Furnace, at Sharpsville, Pa.

The Chattanooga (Tenn.) Iron Co.'s furnace has blown in after several weeks' idleness.

Geo. B. Scovill, iron founder at Waterbury, Conn., has assigned with liabilities of $70,646.

At Florence, Ala., the receiver will resume operations at the Spathite furnace of the Spathite Iron Co.

The old rail mill at the Edgar Thomson Steel Works, idle for three months, has resumed with 250 men.

The Totten & Hogg Iron & Steel Foundry Co., Pittsburg, is running full in all departments day and night.

The American Tin Plate Co., Elwood, Ind., is full of orders. Close to 6,000 boxes is the present weekly output.

All the Pittsburg offices of the Carnegie Steel Co., Ltd., were moved on March 23, into the new Carnegie building.

Zug & Co., Pittsburg, now running 22 puddling furnaces, have given notice that six heats a turn will be worked instead of five.

The Fairbanks, Morse & Co. works at Beloit, Wis., will resume work on ten hours a day at wages which prevailed before the strike.

The stockholders of the James P. Witherow Co. decided last week to borrow $50,000 and put the New Castle plant in operation May 1.

President Ingalls of the C. C. C. & St. L. Ry., has been authorized by the board of directors to spend $350,000 in new equipment.

The Union Brass Mfg. Co., of Chicago, confessed judgment last week to several banks and firms, for amounts aggregating over $30,000.

The strikers at Wallace Banfield & Co.'s tin plate works, Irondale, O., are leaving the place. New hands are operating the plant successfully.

All departments of the Indiana Iron Co.'s mills at Muncie, Ind., are running full. A 1,500 h. p. engine has been installed recently in the muck bar mill.

The Northern Pacific has secured an option on the buildings of the Malleable Iron Works at South Superior, Wis., and will convert them into a car shop.

The furnace of the Elk Rapids Iron Co., at Elk Rapids, Mich., will shut down indefinitely May 1. It was first put in blast in 1873, and has run almost continuously ever since.

Work is progressing slowly in the erection of the new Corliss engine in the rod mill of the New Castle Wire nail Co. A large addition is being made to the company's warehouse.

The Otto-Hoffman coke plant now building at Johnstown, Pa., under the direction of the Cambria Iron Co. and others, is nearing completion. It will be ready for a test in a month or two.

The Junction Iron & Steel Co., of Mingo Junction, O., will dismantle its cut nail factory and retire from the nail business. The company contemplates using the building for the erection of continuous mills.

The Whitaker Iron Co., Wheeling, W. Va., has started up four sheet mills idle for nearly two months. Two other sheet mills in this plant which have been working right along, have been closed down.

Wade Allen, A. J. McGarry and J. V. Allen have taken charge of the Hattie Ensley furnace at Sheffield, Ala., assuming the lease of the Saulsbury Furnace Co., who have been running the furnace since last fall.

The Consolidated Steel & Iron Co., Chicago, has purchased the entire plant and business of the Freemen Wire & Iron Co., of St. Louis. The plant has a capacity of 2,000 tons of barb wire a month and a corresponding capacity of wire nails and plain wire.

Fraser & Chalmers filed a bill in the Circuit Court last week to declare the contract between the City of Chicago and the Holly Mfg. Co. for pumping engines illegal, fraudulent, and void. The plaintiffs declare the contract to have been let under circumstances which make it fraudulent.

The New York Central Railroad has placed an order with the Buffalo Car Mfg. Co. for the construction of 1,500 box cars of the latest and most improved pattern. They will be the most expensive cars ever built by the Central, and will be equipped with air-brakes, automatic couplers and stout trucks.

It is said by Wallace & Sons, of Ansonia, Conn., that the report of the purchase of their copper refinery and brass works is premature. W. A. Clark, the Montana millionaire, who is at present in Europe, has been in negotiation with the Wallaces, and there is a prospect that the deal will be consummated.

At Pittsburg the New York Life Insurance Co. filed a petition for a rule on the Moorhead-McCleane Co., and Geo. S. Griscom, receiver, to show cause why the property should not be sold to satisfy a mortgage for $350,000. This is in pursuance of an order of court made some time ago.

At the Edgar Thomson Steel Works, Superintendent Morrison has done away with the engineering and chemical departments at the blast furnaces. C. S. Murray is made chief of the chemical department for the entire plant. N. Camille Mecador is made chief of the engineering department.

Since March 1, the Rice & Sargent Engine Co., of Providence, R. I., has received three orders for steam engines. One is a tandem-compound of 300 h. p., with cylinders 14 and 26 inches and a 42-inch stroke, independent condenser, to run at 100 revolutions a minute in the Pembroke Mills, Suncook, N. H. The Lawrence, (Mass.) Lumber Co. has ordered a 200 h. p. engine, 20x42, 80 revolutions, and the Oakdale Mfg. Co., of Providence, a 75 h. p. engine, 12x30, 110 revolutions.

The Illinois Steel Co. will rebuild and thoroughly modernize two of its oldest blast furnaces at South Chicago. The stacks are 75 by 19 feet and were built in 1880 and 1881. In their time they were among the best blast furnaces of the country, making records for large output and low fuel consumption. The new blast furnaces at South Chicago, built in 1890 and 1891, have proved capable of producing pig iron at considerably lower cost than their neighbors built only ten years previously.

At Portsmouth, O., last week, the trustees for the creditors

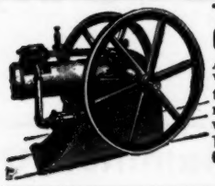
Fred. F. Sharpless. - Horace V. Winchell.

SHARPLESS & WINCHELL,

809 and 811 Wright Block, MINNEAPOLIS, MINN.

Analytical Chemists and Assayers.
Consulting Geologists and Mining Experts.

Mines examined. Advice given on treatment of ores and development of properties.
Intimate acquaintance with Lake Superior Mineral Regions.



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Are the latest and best Vertical and Horizontal Engines on the market. Simple and well constructed.

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THURMAN FUEL OIL BURNER CO.

Gen'l Offices, 35 and 36 Cordova Bldg.,
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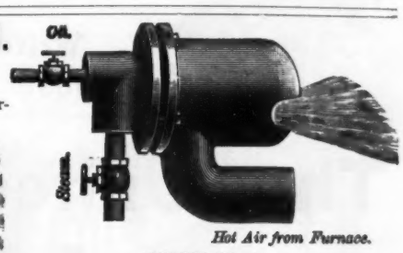
Acknowledged the best for Boilers, Forges, Furnaces, Ovens, etc. Write for Catalogues.

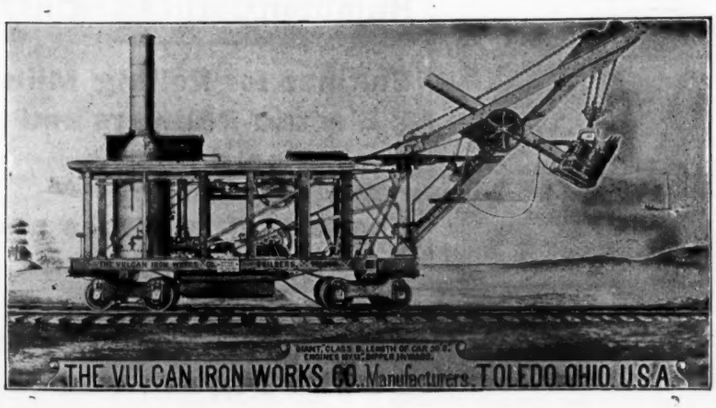
BURNER NO. 6.



BURNER NO. 4

J. POWER HELY, Chicago Manager,
1405 Monadnock Block, Chicago, Ill.

NOTE.—If you are using oil as fuel, and are not getting good results, we would be pleased to send you our burners on trial. The oil in our burners an be atomized by either steam or air.



STEAM SHOVELS!

VULCAN IRON WORKS CO.,

TOLEDO, O., U. S. A.

There is no Steam Shovel on the market so well adapted to handling Iron Ore as our "Giant." We guarantee 2,500 tons in ten hours.

Our "Giant" has the record on the Mesabi Range.

of the Union Iron Co. made public sale of several large tracts of furnace lands in Jackson, Scioto, Gallia and Lawrence counties. There were 90 tracts appraised at $113,000. Certificates which had been distributed pro rata among the creditors were received in payment. All the certificates were presented except $1,740, and at the close of the sale $9,500 in property still remained. A party of Ironton, O., bidders, including the Hecla Iron & Mining Co., secured the well-known Polk patch —205 acres of ore land. Trustees of the McGovney estate got the Washington furnace property.

Recent car orders: The Wheeling & Lake Erie has ordered 600 freight cars. Savannah, Americus & Montgomery will buy 300 flat cars. Mobile & Ohio has placed 100 flat cars with Mt. Vernon Car Mfg. Co. Missouri Car & Foundry Co. has an order for 100 Armour refrigerator cars. Missouri, Kansas & Texas award on 2,000 cars has been postponed. Duluth, Mesabi & Northern will order more cars. Gulf & Inter-State Railroad, Texas, is in the market. Indiana Car & Foundry Co. has a contract for 110 box cars from St. Louis, Vandalia & Terre Haute. The Big Four will soon order 500 new freight cars.

Home-Seekers Excursions South and Southeast via Pennsylvania Lines.

Special low rate excursion tickets with twenty day return limit will be sold March 5th, April 2d and 30th, from ticket stations on the Pennsylvania Lines to points in Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia. For details, apply to nearest Pennsylvania Line Ticket Agent, or address F. Van Dusen, Chief Assistant General Passenger Agent.

THE new factory of the United States Heater Co., at Detroit, is completed and a few days ago was put in full operation. It is one of the completest and best equipped establishments of its class in the country and the company is now prepared to fill promptly all orders for its well known hot water and steam heaters.

TRIED BY FIRE!

The only Cupola Block which gives absolute satisfaction. It is practically indestructible. We have a testimonial from the inventor of the *Colliau Cupola*, recommending it as "the best."

We have them in stock, made to fit any shell. The use of this block means a close, compact wall with few joints, and a great saving in both labor and material Standard size fire brick from same clay.

"EVERYTHING FOR A FOUNDRY."

Write for One of our Hat Calendars.

F. B. STEVENS,

13 Atwater Street, West. DETROIT, MICH.

PURE PLUMBAGO FACING AT MINIMUM COST.

We own and operate our mine in Mexico, and you deal with strictly first hands when you buy from us, which saves you money.

Write for particulars and prices, and remind us to enclose you a Mexican Graphite Pencil.

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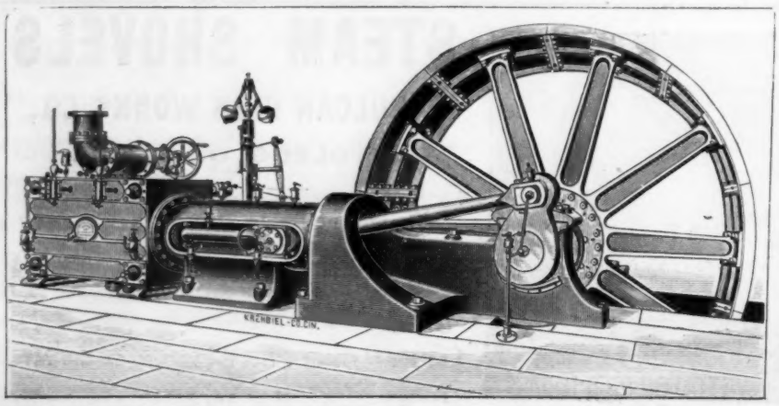
SAGINAW, MICH.

MINES: Near TORRES, SONORA, MEXICO.

THE HOOVEN, OWENS & RENTSCHLER CO., Hamilton, O.



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Engines for Rolling Mills, Electric Railways and Electric Light.

Engines of all Sizes and for all purposes.

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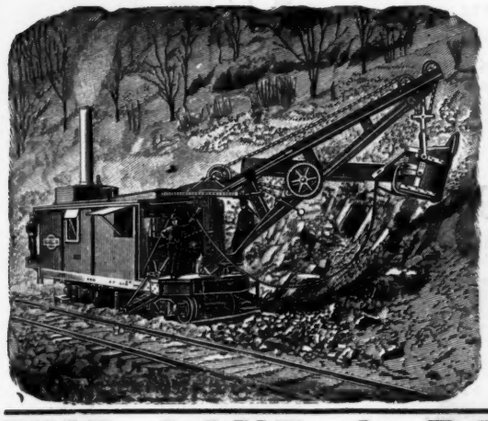
Room A, Laclede Building, ST. LOUIS, MO.
C. C. MOORE & CO., SAN FRANCISCO, CAL.

Bucyrus Steam Shovel & Dredge Co.,



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STEAM DREDGES — Of All Types and Sizes; for All Purposes; Elevator, Dipper, Clam Shell, Suction. Special Machines for Special Work.

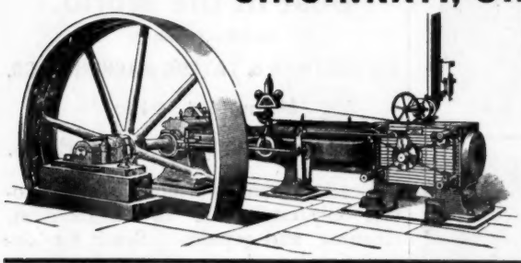
WRECKING CARS — BOTH HAND AND STEAM. CAPACITIES 10 TO 35 TONS.

PILE DRIVERS — WITH EITHER DROP OR STEAM HAMMERS.

SOUTH MILWAUKEE, WIS., or BUCYRUS, OHIO.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



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ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

POWER From GAS OR GASOLINE.

No Steam, Coal, Ash, Gauges, Engineer nor Danger.

From 1 to 120 horse-power. } Can be Used in City or Country.

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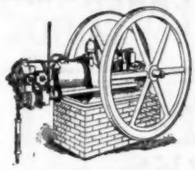
S. M. York, 42 S. Water St., Cleveland Agent.



LOCATIONS FOR INDUSTRIES.

The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company owns and operates 6,154 miles (9,900 kilometers) of railway, exclusive of second track, connecting track or sidings. The eight States traversed by the lines of the company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota, and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle. Many towns on the line are prepared to treat very favorably with manufacturers who would locate in their vicinity.

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tan-bark, flax and other raw materials exist in its territory in addition to the vast agricultural resources.

A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address **LUIS JACKSON,**
Industrial Commissioner, C., M. & St. P. R'y.,
425 Old Colony Bldg., CHICAGO, ILL.

ARE YOU LOOKING

FOR A CHANGE IN LOCATION?

If you are not satisfied with your present site, or if you are not doing quite as well as you would like to, why not consider the advantages of a location on the Illinois Central R. R. or the Yazoo & Mississippi Valley R. R.? These roads run through South Dakota, Minnesota, Iowa, Wisconsin, Illinois, Indiana, Kentucky, Tennessee, Mississippi and Lousiana, and possess

FINE SITES FOR NEW MILLS,
BEST OF FREIGHT FACILITIES,
CLOSE PROXIMITY TO
COAL FIELDS AND DISTRIBUTING CENTERS
AND
INTELLIGENT HELP OF ALL KINDS,
MANY KINDS OF RAW MATERIAL.

For full information, write the undersigned for a copy of the pamphlet entitled

100 Cities and Towns **WANTING INDUSTRIES**

This will give you the population, city and county debt, death rate, assessed valuation of property, tax rate, annual shipments, raw materials, industries desired, etc.

To sound industries, which will bear investigation, substantial inducements will be given by many of the places on the lines of the Illinois Central R. R., which is the only road under one management running through from the North-Western States to the Gulf of Mexico. GEO. C. POWER, Industrial Commissioner I. C. R. R. Co., 506 Central Station, Chicago. I-2-'94.

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311 WALNUT ST., PHILADELPHIA

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Hot Blast Pyrometer.—The only stationary Pyrometer now in use durable over 700 degrees.

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The principal buildings are substantial brick structures, erected for the Architectural Iron business, and are adapted for any kind of Foundry and Machine work. Capacity 25 tons. We are retiring from business, and now offer the land, 325x100 feet, together with the buildings, engines, shafting, cranes, steam derrick, and all machinery and tools in connection with the business, and all in complete running order, for the sum of $150,000. Address,

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Drop Forged of Steel.

THE ARMSTRONG
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Saves all Blacksmith Work.
90% Tool Steel. 60% Grinding
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Litho-Carbon Paint for Metal Roof sand Sidings Bridges, Smokestacks, etc., covers more space than any other Paint; dries quick, won't crack, peel or blister; will stand a heat of 550° Fahrenheit. Send for 32-page catalogue.

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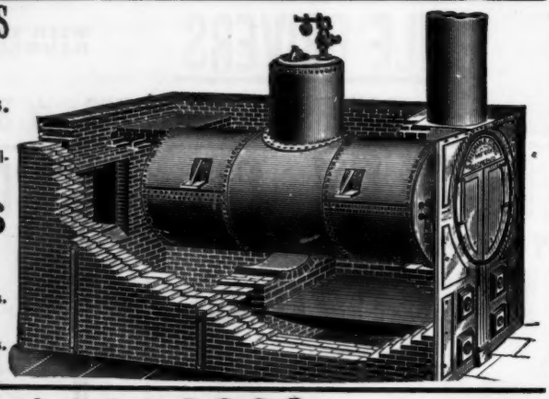

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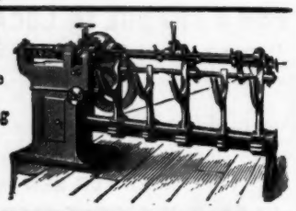
Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines, Butt Milling Machinery, Butt Drilling Machinery, Riveting Machines, Foot Presses, Sprue Cutters, Etc.



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A New Movement!

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One Man can Lift to the Full Capacity of the Block.

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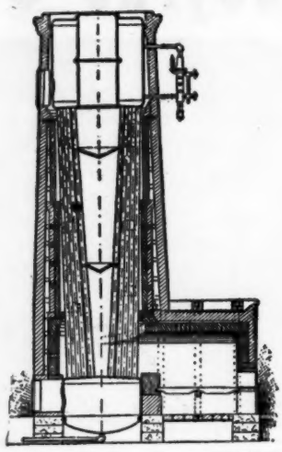

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Leads all makes of boilers in economy, capacity, ease of examination, cleaning and repairs. Send for description, tests, references and estimate before you purchase.

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Wanted.

All around molder, familiar with running cupola in small foundry, in New Jersey; state wages required, and give references. Address

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GASOLINE ENGINES

Stationary & Portable

ALL SIZES.

Dwarfs in size and Giants in Strength.

Costs only 10 cents a Day per H. P. to run them, & scarcely any attention.

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Write for particulars and testimonials.

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Mention this paper when you write.

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AUTOMATIC MOLDING MACHINES

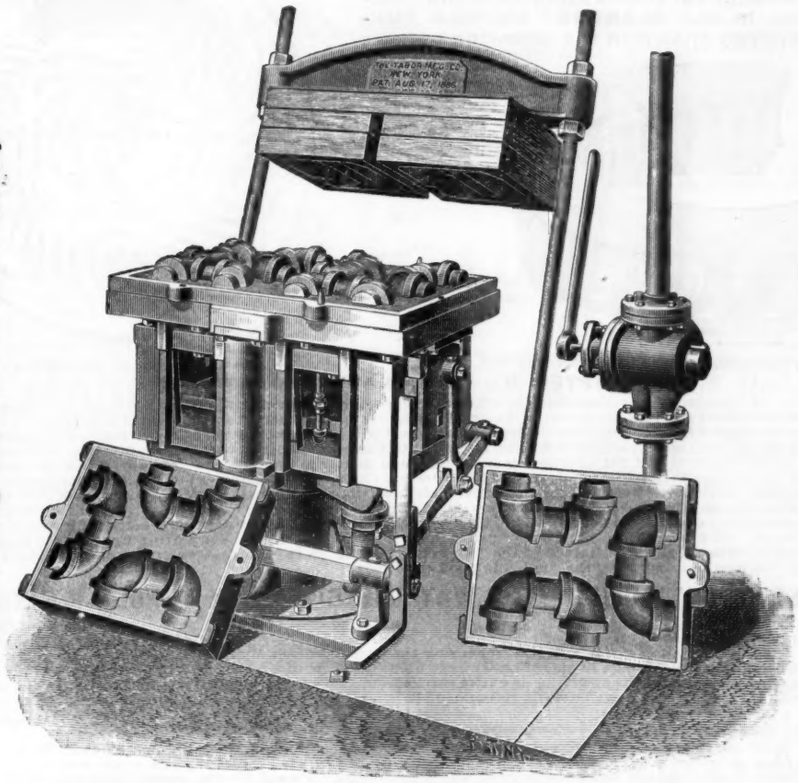
For Sand Molds for Metal Castings.

Note the advantages of the **only Power Molding Machine adapted to different sizes and shapes of flasks:**

Our 16″ Duplex will mold, working Duplex, both parts of flask 12″x16″ and all sizes below; this same machine, when working Single will mold flask 16″x20″ and all sizes under.

Our 20″ Duplex will mold, Duplex, both parts of flask 13″x18″ and all smaller sizes; working Single it will mold flask 18″x24″ and smaller sizes. This feature allows a range of work, by one of our Machines, which would require a number of any other type. This is of the greatest importance to Foundries.

The Milling Machine of the Foundry.



AUTOMATIC DUPLEX MOLDING MACHINE.

These machines are adapted to general castings when made in reasonable quantities.

The use of these machines is a guarantee of economy, greater quantity and better quality in castings.

Foundrymen who are interested in producing cheap castings of superior quality are invited to correspond with the Company and call at the works, Front and Franklin Streets, Elizabeth, N. J., and see the machines in operation.

The Turret Lathe of the Foundry.

113 Libertv Street, - - - NEW YORK, N. Y.

Geo. P. Millns, Pres't and Gen'l Mgr. **Frank H. Chamberlin, Sec'y and Treas.**

The Cleveland Facing Mill Co.,

CLEVELAND, O.

MAKERS OF HIGH GRADE

Importers of LUBRICATING Plumbago.

FOUNDRY FACINGS,

FOUNDRY SUPPLIES,

FOUNDRY EQUIPMENTS.

Importers of INDIA SILVER AND German Black Lead.

And the Celebrated C. F. M. Founders' Perfect Wash, and Heavy A. A. Pure Plumbago. Also Stove Plate Blackings which have never been beaten.

Write for prices on anything you may want. Trial orders solicited.

The Reason Why

Economy of fuel, rapid melting, the production of a uniform grade and strength of iron is attained in the highest possible degree in the BLAKENEY CUPOLA FURNACE is comprehensively shown in the following cuts:

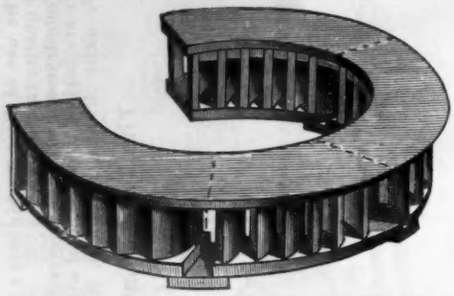


Fig. 1—The Combination of Sections of Tuyeres as placed in wall.

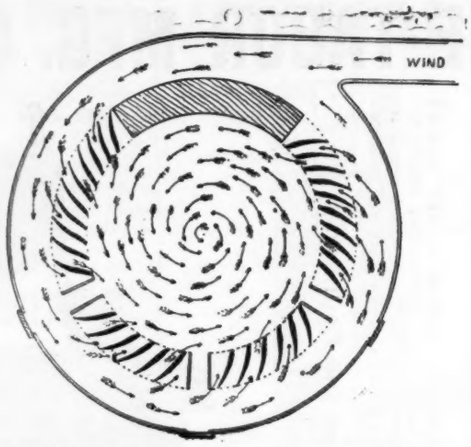


Fig. 2—Showing direction of Wind through the Curved Tuyeres.

ADOPTED BY U. S. NAVY DEPARTMENT.

Upon the manner of introducing the blast into the cupola depends the degree of combustion attained, consequently that form of tuyeres which will produce maximum results at a minimum cost is the great desideratum. We assert that this has been reached in the "Blakeney" tuyeres to a higher and more satisfactory degree than in any other device known, whether it be a combination of upper and lower tuyeres, a series of pipes, or the old-fashioned tuyeres; and we are certain that a little reflection on the part of any one familiar with cupola practice, will convince him that the projection of the blast through CURVED tuyeres will not only insure its penetration nearer to the center of the cupola, but its more even distribution to all parts of the cupola as well. It is upon this self-evident fact that we base our claim of the attainment of a combustion more nearly approaching perfection than by any other method. With better combustion it necessarily follows that there must be greater economy of fuel, faster melting, less "hanging up," and the production of a more uniform grade and strength of iron. In a word, the "Blakeney" cupola is a continual source of profit and satisfaction in a foundry, and to any one desirous of improving their melting facilities, or who are in the market for a new cupola, we shall be pleased to send a descriptive catalogue. We are quoting "hard time" prices and solicit the privilege of submitting figures. To those whose cupolas are being run at a daily loss as compared with the results attained in the "Blakeney," we desire to state that we are prepared to apply these patent tuyeres and air-chamber to old cupolas at a nominal cost when the shell is in good condition.

A FEW "STRAWS" SHOWING THE WAY THE BLAKENEY CUPOLA "WIND" BLOWS.

LANCASTER, PA., August 29th, 1894.

The Springfield Cupola Co., Springfield, Ohio.

GENTLEMEN: In answer to yours of the 27th inst. regarding the working of the Blakeney Cupola purchased from you in January last, we are pleased to state that since getting the Cupola in operation we have been in receipt of a number of inquiries from interested parties, and our reply has invariably been to the effect that the Cupola is giving us entire satisfaction. We never handled one that melts iron so rapidly, and for rapid work and satisfactory results with the castings we can cheerfully recommend it. Yours truly, THE HUBLEY MANF'G CO., F. H. Steacy, Sec'y.

FULTON, ILL., Aug. 29, 1894.

The Springfield Cupola Co., Springfield, Ohio.

GENTLEMEN: Replying to your favor of recent date we would say that it affords us pleasure to state that the No. 4 Blakeney Cupola bought of you last November is giving us just as good satisfaction as the Blakeney we had in use for fifteen years in our works at Tiffin, O. During this time we were familiar with cupolas of other makes, but knew of none which could give the good results attained in yours, consequently when we removed our plant to this city, and were in the market for a new cupola, we immediately communicated with you for the purchase of a new Blakeney. You may refer to us whenever the opportunity offers. Yours truly, THE MISSISSIPPI VALLEY STOVE CO.

SEND FOR CATALOGUE No. 2.

THE SPRINGFIELD CUPOLA CO., Springfield, Ohio.

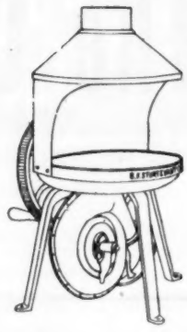
STURTEVANT PORTABLE FORGES.

IMPROVED HAND FORGE.

No. E 1.

No. E 2.

For Jewelers,
Locksmiths,
Tinsmiths, etc.,
And the lightest work.



No. A 1.

For Wagon and
Carriage Smiths,
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And general light work.

B. F. STURTEVANT COMPANY,

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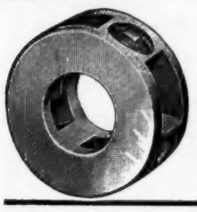

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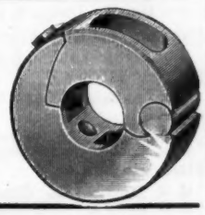

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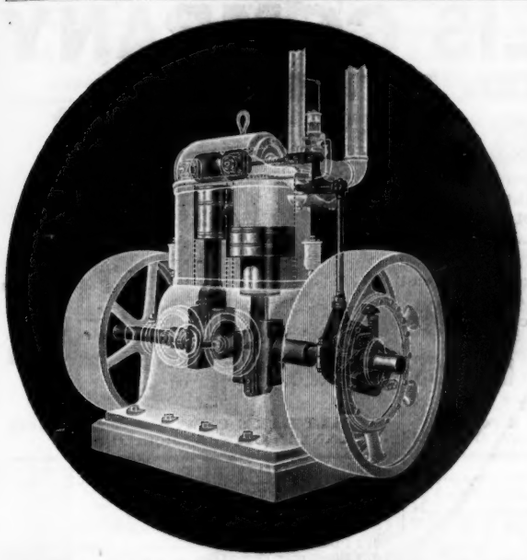

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Cleveland Twist Drill Co., Cleveland.
Manufacturers' Tool Supply Co., Chicago.
C. H. Besly & Co., Chicago, Ill.

Valves—
Ed. Wertheim, Chicago.
C. H. Besly & Co., Chicago, Ill.

Washers—
Milton Mfg. Co., Milton, Pa.

Wire Fences—
McCallip Fence Co., Columbus, O.

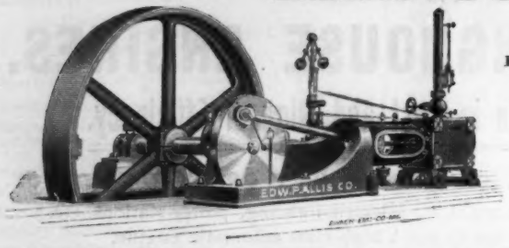
Wire Goods—
McCallip Fence Co., Columbus, O.

Wire Rope—
W. A. Crook & Bro's Co., Newark, N. J.
C. W. Hunt Co., New York City.
George Cradock & Co., Chicago, Ill.

Wire Machinery—
John Adt & Son, New Haven, Conn.
Cady Mfg. Co., Cleveland, O.

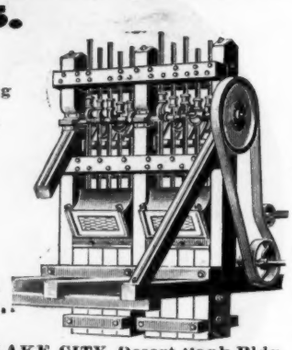
When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

THE EDWARD P. ALLIS COMPANY
MILWAUKEE, WIS.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting, Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills, Concentrators, General Mining, Milling and Smelting Machinery.



REYNOLDS PATENT VERTICAL BOILERS. REYNOLDS CORLISS ENGINES.

NEW YORK, Room 1111, Havemeyer Bldg. DENVER, 1316 18th Street. SALT LAKE CITY, Desert Bank Bldg.
CHICAGO, Room 509, Home Ins. Bldg. SAN FRANCISCO, 31 Main Street. KANSAS CITY, Armour Bldg.
MINNEAPOLIS, Room 416, Corn Exchange. PITTSBURG, 704 German Nat'l Bank Bldg.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Adt, John & Son	21
Aitchison, Rob't Perforated Metal Co	29
Allis & Co., Edward P	28
American Fire Brick & Clay Co	17
Armstrong Bros	21
Armstrong Bros. Tool Co	32
Barnes Co., W. F. & John	25
Bell & Co., Thos. J	33
Besly & Co., G. H	34
Bethlehem Iron Co	33
*Berger Mfg. Co	21
Bertsch & Co	16
Bickford Drill & Tool Co	25
Bickford, H	34
Brown, Edward	20
Buckeye Mfg. Co	2
Bucyrus Steam Shovel & Dredge Co	20
Buffalo Forge Co	1
Byers Machine Co., John F	33
Cady Mfg Co	29
Cary, & Wilkins	1
Chicago Chemical Solution Co	31
Chicago Compound & Chemical Co	16
Chicago Heights Land Ass'n	20-21-28-31-32
Cincinnati Milling Machine Co	1
Clark Raffen & Co	20
Clearfield Fire Brick Co	33
Cleveland City Forge & Iron Co	1
Cleveland Electrotype Foundry	33
†Cleveland Facing Mill Co	23
Cleveland Rolling Mill Co	33
Cleveland Twist Drill Co	34
*C. M. & St. P. Ry	20
Cole, J. Wendell	34
Collins & Co., H. E	21
Condit-Fuller Co	31
Consolidated Roofing Works	34
Cradock & Co., George	1
Crook & Bro's Co	30
Dayton Gas & Gasoline Engine Co	18
Deming Co	32
Dessau, S. D	32
Detroit Graphite Mfg. Co	32
Dickman & MacKenzie	2
Dixon, Jos. Crucible Co	29
Dover Fire Brick Co	2
Eclipse Electrotype & Engraving Co	20
Emmerton, F. A	2
*Empire Paint & Roofing Co	21
Enterprise Boiler Co	34
Fleharty, J. H. & Co	31
†Foos Gas Engine Co	—
Forster, Hawes & Co	1
Fox Machine Co	1
Fraser, John	16
*Freeman & Sons, S	21
Gerlach, Peter & Co	31
Gouverneur Machine Co	25
Harrington & King Perforating Co	32
Hartford Steam Boiler Insp. & Ins. Co	2
*Hendrick Mfg. Co., Ltd	—
Hill, Clarke Co	25
*Hodell, H. H. & Co	21
Hooven, Owens & Rentschler Co	19
Hunt Co., C. W	30
Illinois Central R. R	20
Illinois Screw Co	1
Iron Clad Paint Co	29
Jeffrey Mfg. Co	33
Jessop & Sons, Ltd., Wm	25
Jones Foundry Co., W. A	1
Jopling & Escobar	31
Keasbey & Mattison Co	2
Kurtz & Buhrer Foundry Co	25
Lane & Bodley Co	20
Lloyd Booth Co	32
*Lodge & Shipley	34
Long & Allstatter Co	29
Lunkenheimer Co	30
Magnolia Anti-Friction Metal Co	1
†Mallett D. T	—
Manufacturers' Tool Supply Co	25
*Millett Core Oven Co	—
Milton Mfg. Co	34
Milwaukee Foundry Supply Co	16
Mitts & Merrill	34
Moore Mfg. & Foundry Co	21
Newell Bros	1
New York Machinery Depot	25
Oak Hill Fire Brick & Coal Co	30
Oglebay, Norton & Co	31
Ohio Sand Co	34
Otto Gas Engine Co	20
Parker, Richard A	33
Pen Argyl Iron Works	33
Pittman, C. K	2
Pollock, Wm. B. & Co	2
Pope, R. C	31
Prentiss Tool & Supply Co	25
Q & C Co	34
Reese, Hammond & Co	34
Rhoads & Sons	—
‖Sharon Fire Brick Works	1
Sharpless & Winchell	18
Shiffler Bridge Co	31
†Springfield Cupola Co	24
Stevens, F. B	19-34
Stilwell-Bierce & Smith-Vaile Co	2
Stowe, Fuller & Co	17
Sturtevant Co., B, F	2-24
Swarts Metal Co	1
Sykes Iron Roofing Co	21
†Tabor Mfg. Co	23
Tanite Co	34
Taylor & Boggis Foundry Co	1
Thurman Fuel Oil Burner Co	18
Timolat, J. G	25
Tod, Wm. & Co	32
Toledo Machine & Tool Co	33
Totten & Hogg I. & S. F'dry Co	30
Union Mining Co	17
United States Graphite Co	19
United States Heater Co	34
Upson Nut Co	31
Van Duzen Gas Engine Co	21
Vulcan Iron Works	18
Warren, Webster & Co	33
Wertheim, Ed	1
Westinghouse Machine Co	27
Westmoreland Fire Brick Co	29
Wheeler Boiler Co	32

FOR SALE, CHEAP.

A well equipped **Machine Shop** in a flourishing town near Chicago. Shop, 80x200 feet; about three acres of ground; side track; electric light; heated by Sturtevant system of hot air. If wanted, will include full line of Steam Pump patterns, drawings, etc. Address,

MACHINE SHOP,

Care The Iron Trade Review,

1142 Monadnock Blk., CHICAGO.

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The Industrial Centre of Chicago

offers **Free Factory Sites** and other inducements.

If you are seeking a new location it will pay you well to investigate the merits of our proposition.

Chicago Heights Land Association

M. H. KILGALLEN, Gen'l Mgr. CHICAGO

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IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

No. 1 Specular, Bessemer	3.00@ 3.35
No. 1 Bessemer hematite	2.75@ 3.00
Hematites No. 1 non-Bessemer	2.00@ 2.50
No 1. Specular, non-Bessemer	2.35@ 3.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$10 25@$10 50
No. 1 Strong Foundry	10 75@ 11 00
No. 2 Strong Foundry	9 75@ 10 00
No. 1 Gray Forge, red short	9 10@ 9 25
No. 2 Gray Forge, neutral	9 00@ 00 00
No. 1 American Scotch	11 00@ 00 00
No. 2 American Scotch	10 00@ 00 00
Lake Superior Charcoal	13 00@ 13 50
PITTSBURG:	
No. 1 Foundry	$11 25@$11 75
No. 2 Foundry	10 25@ 10 75
Gray Forge	9 10@ 9 25
White and Mottled	9 00@ 0 00
Warm Blast Charcoal	17 00@ 18 00
Cold Blast Charcoal	22 00@ 26 00
Bessemer	10 25@ 10 40
CHICAGO (reported by our representative:)	
Lake Superior Charcoal	$13 00@$13 50
Local Coke Foundry No. 1	10 25@ 10 50
Local Coke Foundry No. 2	9 75@ 10 00
Local Coke Foundry No. 3	9 40@ 9 65
Local Scotch Foundry No. 1	10 25@ 10 50
Local Scotch Foundry No. 2	9 75@ 10 00
Local Scotch Foundry No. 3	9 50@ 9 75
Southern Coke No. 1	11 00@ 11 25
Southern Coke No. 2	10 00@ 10 25
Southern Coke No. 3	9 50@ 9 75
Southern No. 1 Soft	10 00@ 10 25
Southern No. 2 Soft	9 75@ 10 00
Southern Silveries No. 1	11 50@ 11 75
Southern Silveries No. 2	11 25@ 11 50
Jackson Co. Silveries	15 00@ 16 00
Ohio Silveries No. 1	14 00@ 14 50
Ohio Silveries No. 2	13 00@ 13 50
Ohio Strong Softeners	12 50@ 13 00
Alabama Car Wheel	17 50@ 18 00
Malleable Bessemer	11 00@ 11 50
Coke Bessemer	11 00@ 11 50
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	$ 9 50@$10 00
Southern Coke No. 2 and No. 1 Soft	9 00@ 9 25
Hanging Rock Coke, No 1	11 50@ 12 00
Hanging Rock Charcoal No. 1, Fdy	15 00@ 16 50
Tennessee Charcoal No 1	13 00@ 14 00
Jackson County Stone Coal No 1	14 00@ 14 50
Southern Coke, Gray Forge	8 25@ 8 50
" " Mottled	8 00@ 8 25
Standard Alabama Car Wheel	15 00@ 16 00
Tennessee " "	14 50@ 15 00
Lake Superior " "	13 50@ 14 00

OLD RAILS AND SCRAP METAL.

[Prices paid by mills.]

	Gross Tons
Old iron rails	$12 50
Old steel rails	10 00
	Net Tons
No. 1 R. R. wrought scrap	$ 9 00
No. 1 wrought scrap	8 00
No. 1 Machine cast scrap	8 00
Iron axles	14 50
Axle turnings	7 50
Wrought turnings (free from cast)	6 50
Cast borings	5 50
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 50
Pipes and flues (clean)	7 00
Tank iron	7 50
Hoop and band iron	6 00
Sheet iron	5 50
Wrought drillings	6 50
Malleable iron	8 00

STRUCTURAL MATERIAL.

Beams and Channels (Cleveland mill)	1.30c@1.35c
Angles	1.20c@1.25c
Tees	1.35c@1.45c
Universal Plates	1.20c
Sheared Plates	1.30c

MERCHANT IRON AND STEEL.

[List prices out of store.]

Flat Bar.

1½ to 4 by ¾ to 1 inch	1 10
4½ to 6 by ¾ to 1 inch	1 15
1¾ to 6 by 1¼ to 2 inch	1 30
1¾ & 1¾ by ¾ to ¾ inch	1 15
1 & 1¼ by ¾ to ¾ inch	1 20
⅛, ¼, ⅜, by ¾ to ⅞ inch	1 30

Frank P. Cady, Pres. and Supt.
Geo. H. Bowler, Sec'y and Treas.
THE CADY MFG. CO.
283 W. River St., CLEVELAND, O.

SEND FOR OUR NEW CATALOGUE OF Power Presses, Drop Hammers, Punches and Shears, Wire Working and Special Machinery.

PERFORATED METALS

OF ALL KINDS FOR
MILLING MINING AND
AGRICULTURAL MACHINERY,

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.

THE ROBERT AITCHISON. PERFORATED METAL CO.,

OFFICE, ROOM 510 265 TO 269 DEARBORN STREET, CHICAGO, ILL. WORKS SOUTH CHICAGO.

—THE—

Splice Bar Punch. 1

Long & Allstatter Co.

HAMILTON, O., U. S. A.

Manufacturers of Belt, Steam and Electrically driven

POWER PUNCHES and SHEARS,

for all kinds of Boiler, Tank and Structural Iron Work, Rolling Mills, Locomotive Shops, Car and Wagon Shops. Plow Shops, etc. Send for Catalogue.

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WESTMORELAND FIRE BRICK CO.
MANUFACTURERS OF HIGH GRADE FIRE BRICKS.
PITTSBURG, PA.
Works and Mines, Westmoreland, Pa.

DIXON'S PERFECT LUBRICATING GRAPHITE.
The most Marvelous Lubricant Known.
Used Dry, or Mixed with Water, Oil or Grease
NOT AFFECTED BY HEAT, COLD, STEAM OR ACIDS.
An Interesting and Instructive Pamphlet will be sent Free of Charge.
JOS. DIXON CRUCIBLE CO. Jersey City, N. J.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

Round and Square.

1 to 1⅞ inch	1 10
2 to 2⅞ inch	1 20
2¾ to 3¼ inch	1 35
3⅜ to 4 inch.	1 60
4⅛ to 4½ inch	2 20
4¾ to 5 inch	2 40

Oval.

⅜ to 1¼ inch	1 30
⅝ to ¾ inch	1 30
½	1 50
⅝	1 70

Half Oval and Half Round.

1¼ to 3 inch	1 65
⅜ to 1⅛ inch	1 45
⅝ to ¾ inch	1 70
½	1 83
⅝	2 95

Heavy Band.

1¾ to 6 by ¼ and 5-16 inch	1 20
1 to 1⅜ by ¼ and 5-16 inch	1 25
¾ to ⅞ by ¼ and 5-16 inch	1 35
½ to ⅝ by ¼ and 5-16 inch	1 60

Hoop Iron.

1 7-16 to 4, No. 13, 14, 15 and 16	1 65
1 7-16 to 2, No. 17, 18 and 19	1 70
1 7-16 to 2, No. 20	1 80
1 7-16 to 2, No. 21	1 90
1 7-16 to 2, No. 22	2 00
1⅛ to 1¾, No. 13, 14 and 15	1 70
1⅛ to 1¾, No. 16, 17 and 18	1 75
1⅛ to 1¾, No 19 and 20	1 80
1⅛ to 1¾, No. 21	1 90
1⅛ to 1¾, No. 22	2 00
15-16 and 1 inch, No. 13, 14 and 15	1 65
15-16 and 1 inch, No. 16, 17 and 18	1 80
15-16 and 1 inch, No. 19 and 20	1 90
15-16 and 1 inch, No. 21	2 00
15-16 and 1 inch, No. 22	2 10
⅞, No. 13, 14 and 15	1 90
⅞, No. 16. 17 and 18	2 00
⅞, No. 19 and 20	2 10
⅞, No. 21	2 20
⅞, No. 22	2 30
13-16, No. 13, 14 and 15	2 00
13-16, No. 16, 17 and 18	2 10
13-16, No. 19 and 20	2 20
13-16 No. 21	2 30
13-16, No. 22	2 40
¾, No. 13, 14 and 15	2 10
¾, No. 16, 17 and 18	2 25
¾, No. 19 and 20	2 35
¾, No. 21	2 45
¾, No. 22	2 55
11-16, No. 13, 14 and 15	2 35
11-16, No. 16, 17 and 18	2 40
11-16, No. 19 and 20	2 50
11-16, No. 21	2 60
11-16, No. 22	2 70
11-16, No. 23	2 80
⅝, No. 13, 14 and 15	2 40
⅝, No. 16, 17 and 18	2 50
⅝, No. 19 and 20	2 60
⅝, No. 21	2 70
⅝, No. 22	2 80
⅝, No. 23	2 90
9-16, No. 13, 14 and 15	2 60
9-16, No. 16, 17 and 18	2 70
9-16, No. and 20	2 80
9-16, No. 21	2 90
9-16, No. 22	3 00
9-16, No. 23	3 10
7-16 and ½ inch, No. 13, 14 and 15	2 80
7-16 and ½ inch, No. 16, 17 and 18	2 90
7-16 and ½ inch, No. 19 and 20	3 00
7-16 and ½ inch, No. 21	3 10
7-16 and ½ inch, No. 22	3 20
7-16 and ½ inch, No. 23	3 30
⅜, No. 13, 14 and 15	3 30
⅜, No. 16, 17 and 18	3 40
⅜, No. 19 and 20	3 50
⅜, No. 21	4 80
⅜, No. 22	3 90
⅜, No. 23	4 05

Light Band.

1½ to 6 by ⅛ to 3-16 inch	1 40
1¼ to 6 by Nos. 11 and 12.	1 45
1 to 1¾ by ⅛ to 3-16 inch	1 45
1 to 1⅜ by Nos. 11 and 12	1 50
⅞ and 13-16 by ⅛ to 3-16 inch	1 60
⅞ and 13-16 by Nos. 11 and 12	1 65
¾ and 11-16 by ⅛ to 3-16 inch	1 70
¾ and 11-16 by Nos. 11 and 12	1 75
⅝ and 9-16 by ⅛ to 3-16 inch	1 85
⅝ and 9-16 by Nos. 11 and 12	1 90
½ by ⅛ to 3-16 inch	2 00
½ by Nos. 11 and 12	2 05

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	1 60
⅞ inch, " " " " 13 and 14	1 70
¾ inch, " " " " 11 and 12	1 75
¾ inch, " " " " 13 and 14	1 05

Sheet Iron.

No. 10	1 65
No. 12	1 75
No. 14	1 80
No. 15-17	1 90
No. 18	2 05
No. 20	2 20
No. 22-24	2 30
No. 25-26	2 40
No. 27	2 50

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 50
Shell	1 70
Flange	1 80
Marine Flange	2 10
Fire Box	3 00

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1 c. "
100 to 104 in. wide	1½c. "
104 to 106 in, wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	08
9-16 to ½ in. "	08½

HOISTING MACHINERY for Mining, Quarrying, Coal Handling, Pile Driving, Bridge Building, Log Hauling, and for general Contractors' Use. Improved Electric Hoists, single and double Patent Friction Drum, compound, geared with brakes and reversible for general Hoisting, Mining Purposes and Suspension Cable Ways.

Send for Illustrated Catalogue giving full description, etc.

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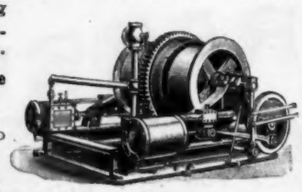

W. A. CROOK & BROS' CO.

Salesrooms 143 Liberty St, N. Y. 117-123 POINIER ST., Newark, N. J.

C. W. HUNT COMPANY,

45 Broadway, New York,

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Engineers' and Contractors' MACHINERY

For Hoisting and Conveying Purposes.

SECTIONAL TRACK, INDUSTRIAL AND CABLE RAILWAYS. BARROWS, COAL BUCKETS, WIRE ROPE, TIP CARS, ETC.

GLASS OIL CUPS

Thirty years ago we started to make Oil Cups, and have made them ever since. We therefore pretend to know a little about them. We claim an endless variety made upon practical and scientific principles. Whenever you see "Lunkenheimer" stamped on a cup—it means the best and is a guarantee for superior quality. Our new Catalogue will tell you what we make; gratis upon request. Always specify "Lunkenheimer's" and you make no mistake.

THE LUNKENHEIMER COMPANY.
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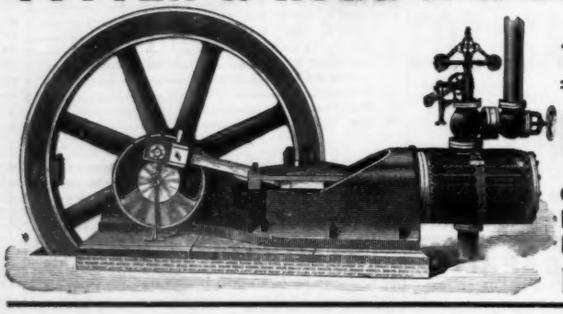
TOTTEN & HOGG I. & S. F'DRY CO.

Manufacturers of



The "Ætna" Rolling Mill **ENGINE,**

Chilled and Sand Rolls and Rolling Mill Machinery.

Pittsburg, Pa.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

All the Pinkertons in the land could not detect a flaw in our....

OUR .. PRICES ARE .. JUST . RIGHT.

"O.K." CROWN

High grade Fire Brick, because they are made from the **BEST** material by **SKILLED** and **EXPERIENCED** Workmen. They are **WARRANTED** to give satisfactory service.

OAK HILL FIRE BRICK AND COAL CO. Manufacturers

.....OAK HILL, OHIO

7-16 to ⅜ and 2⅜ to 3 in.	.09
3½ to 4 in.	.09½
⅜ to 11-16 and 4½	.10
½ to 6 in.	.10¼
¼ to 9-32 and 6¼ to 7 in.	.11
16 in	.13

Flats.

	cts. lbs.
2 to 9-16 in. wide by 2 to ⅜ thick	.8

Bessemer and O. H. Steel.

Machinery	base price,	1 50
Tire	"	1 60
Spring	"	2 10
Sleigh Shoe	"	2 00
Toe Calk	"	2 05
Cutter Shoes, tapered and bent	"	2 10

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 30
Bridge ½, ⅝, 11-16 and ¾ inch diam.	3 00

MACHINERY SUPPLY MARKET.

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 70
" " " extra	dis 60&5
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 45
Shultz Raw Hide Leather Belting, single,	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35
Buffalo	dis 40

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 30
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis35
Horton's Universal	dis40
" Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 40
Sweetland "	dis 40
Almond Drill	dis 20
Morse "	dis 15
Skinner's Combination Lathe	dis 40&10
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 20

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	dis 50&10
Morse Taper and Straight Shank to 1½"	dis 50&10
Morse Taper and Straight Shank Larger than 1½"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 55@55&5
Cleveland " "	dis 55@55&5

Emery.

	No. 4 to No. 46 gr.	No. 54 to 150 gr.	Flour, C. F F. FF.
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¾c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6½c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Grant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 55
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F.	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70

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* Daily. † Daily, except Sunday.

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Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	†12:45 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	† 3:25 pm	† 9:50 am
Hudson and Ravenna	* 5:00 pm	* 8:25 am
Philadelphia and New York	*11:10 pm	* 5:25 am
Baltimore and Washington	*11:10 pm	* 5:25 am
Alliance and Pittsburgh	*11:10 pm	* 5:25 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:40 am	* 5:15 pm
Akron and Columbus	* 8:40 am	*5:15 pm
Akron, Columbus & Zanesville	†2:45 pm	*12:10 pm
Akron and Orrville	† 3:25 pm	† 9.50 am
Columbus and Cincinnati	* 8:00 pm	* 6:55 am

Saturdays the 8:00 pm train will leave at 11:20 pm.

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	Arrive.	Depart.
Akron & Canton	*6:30 P M	*7:10 A M
Akron, Canton & Valley Jctn.	*10:10 A M	*3:15 P M
Valley Jctn. & Way Stations	†6:30 P M	†7:10 A M
Akron, Canton & Chicago	*8:00 A M	*6:30 P M
Wooster and Chicago	†2:45 P M	†11:00 A M
Wooster		†6:30 P M
Akron, Canton & Marietta	†2:45 P M	†11:00 A M
Steubenville, Wheeling, Washington, D. C., and Baltimore	†2:45 P M	†11:00 A M

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Western	dis 70
Stub's	dis 25
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 50
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	12c
" " " " over 5 lbs	10c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15½	11½	8½	6	5½	5¼	
Washers	9	8	7	5	4½	4¼	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire).

List July 14, 1887	dis 85
Standard Penny Nails, ₩ keg card rate	
{ Car lots	$1.05
{ Less than car lots	$1.15

Oilers.

Zinc and Tin	dis 60
Brass and Copper	dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz	dis 10@10&10

Packing, Steam.

Boston Belting Co.	dis 60
American Packing Hemp	₩ lb 9@10
Russia " "	₩ lb 14
Italian " "	₩ lb 13@19
Plumbago Piston	₩ lb 40
Peerless	₩ lb 60
Morrison's "	₩ lb 45
Square Flax "	₩ lb 35@50
Sheet Rubber	₩ lb 12&24
Excelsior Rubber	₩ lb 48
Rainbow { Full Rolls	45c ₩ lb
Rainbow { Less than Full Rolls	50c ₩ lb
Eclipse Gasket	₩ lb 75

Picks.

Railroads, 5 to 6 lbs	$12 dis 60
" 6 to 7 lbs	$13 dis 60

Pulleys.

Iron Pulleys, Walker List	dis 50
Medart Pulleys	dis 50
Split Wood Pulleys	dis 55@60

Rivets.

Iron, Thousand, list November 1, 1894	dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894	dis 60@65
Copper	dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in	dis 50
Carpenters' " " "	dis 50
Morse " " "	dis 50
Pratt & Whitney " " new list	dis 10
Machine Screw Taps	dis 55
Pipe Taps to 2½ in	dis 70
Stay Bolt Taps	dis 25
Stove Bolt Taps	dis 55
Pulley Taps	dis 40

Vises.

Solid Box	dis 60
Parker's	dis 20@25
Prentiss	dis 20
Stephen's	dis 25@30
Barrett's	dis 30
Miller's Falls	dis 40
Merrill's	dis 15@20
Howard	dis 35

Wire.

New List, Apr. 9, 1894

Brass	dis 40
Copper	dis 40
Bright and annealed, Nos. 0@18	dis 70&10@75
" " Nos. 19@26	dis 75@75& 5
" " Nos. 27@36	dis 75&10& 5
Coppered Nos. 0 to 18, market list	dis 70@70& 5
Galvanized Nos. 0 to 18 " "	dis65& 5
Tinned market Nos. 0 to 18	dis 67½
Cast steel	dis 50
Tinned Broom Wire	dis 70&5@70&10
Annealed Fence, Nos. 8 and 9	dis 75
Annealed Grape, Nos. 10 to 14	dis 75
Stub's Steel Wire regular	95c ₩ lb dis 30

Wrenches.

Coe's genuine	dis 50
Girard Standard	dis 70&10
Agricultural	dis 75&10
Mechanic's	dis 55&10& 5
Bemis & Call's Combination	dis 35
Donohue's Engineers	dis 20&10
Lamson & Sessions Engineers	dis 60
Billings & Spencer's Drop Forged	dis 25
William's " "	dis 25
Alligator " "	dis 40

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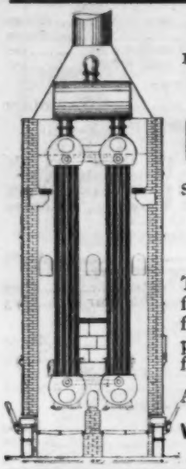

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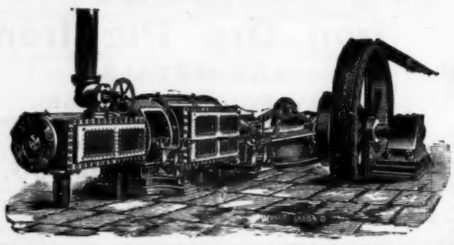

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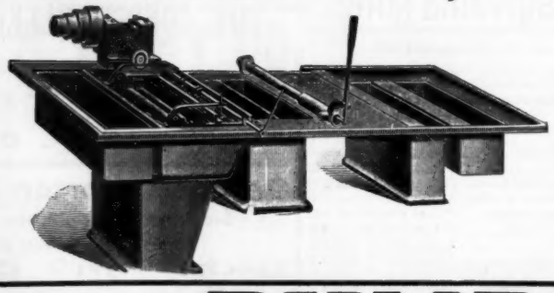

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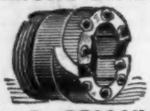

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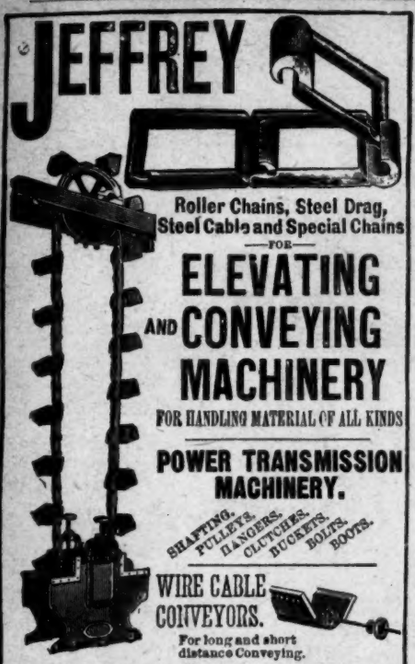

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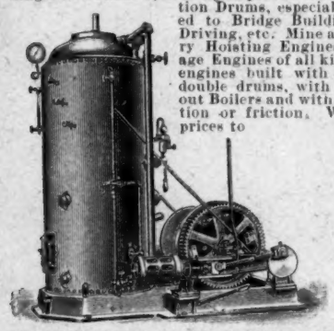

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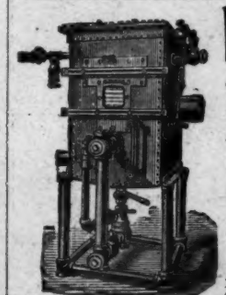

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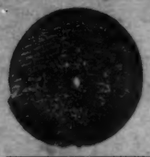

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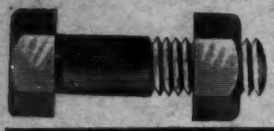

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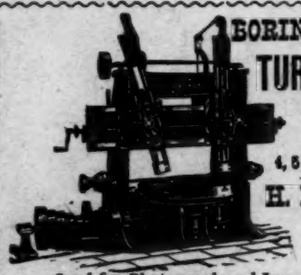

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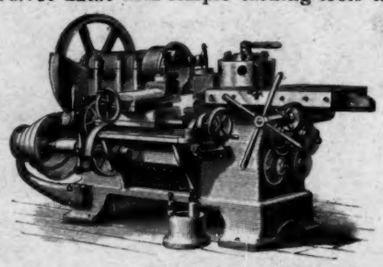

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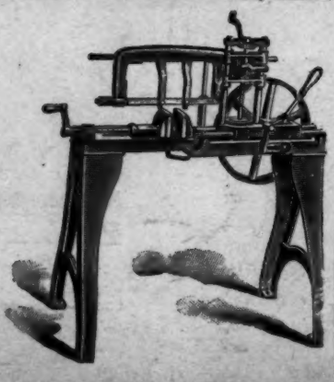

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